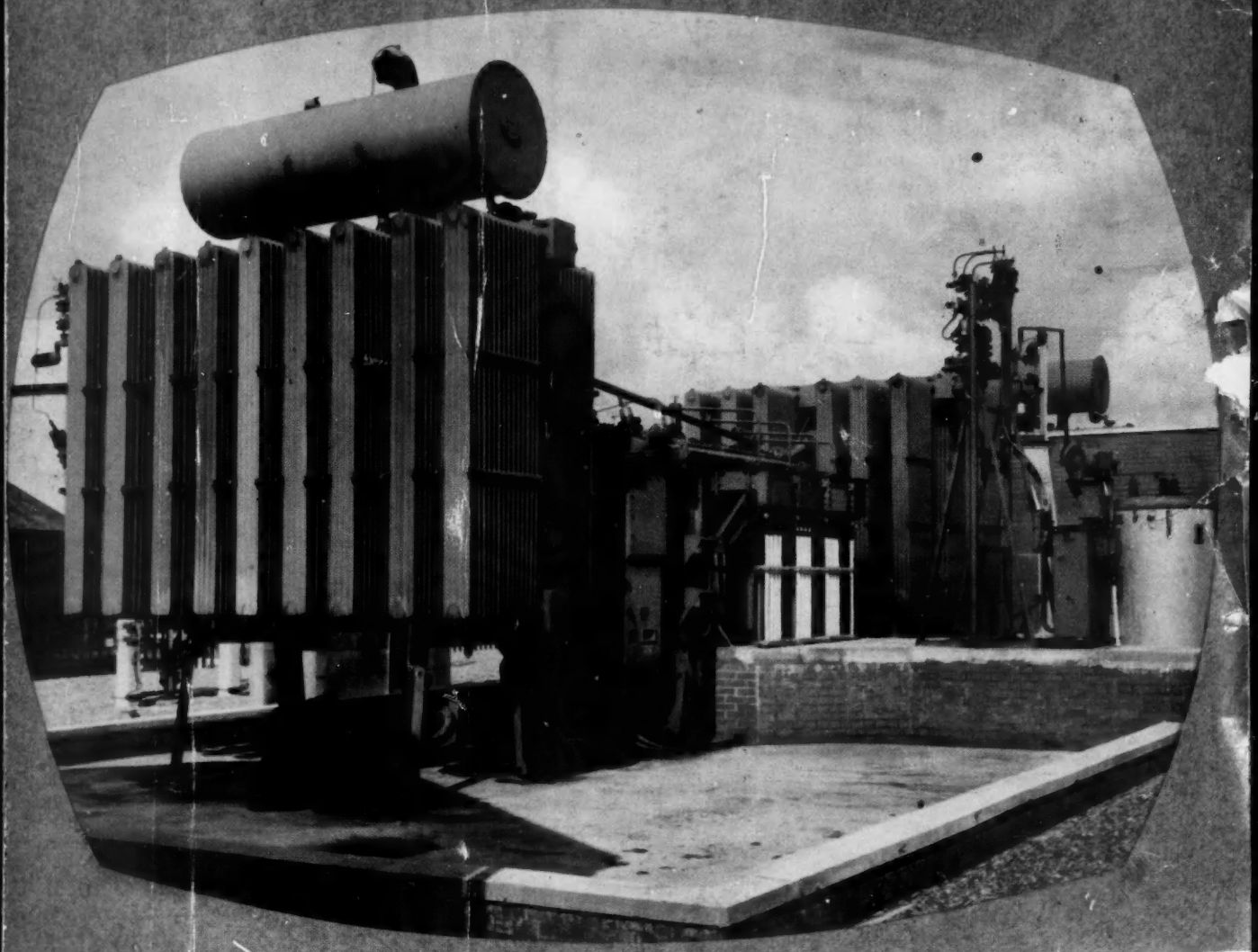
1 JULY 1954

NINEPENCE

ELECTRICAL TIMES



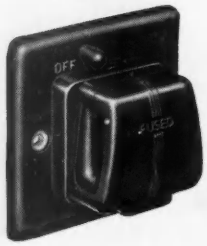
TRANSFORMERS by G.E.C.

There's a Miniac for every switching operation

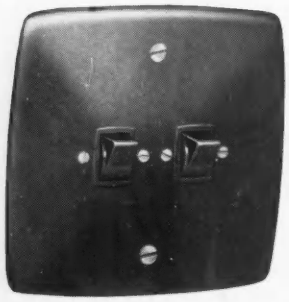
and they all save you TIME! LABOUR! MONEY!

Neat and attractive, this ceiling switch is easy to install and competitive in price

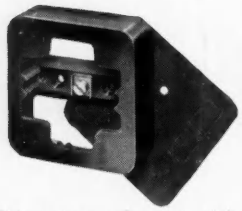
15 and 30-amp D.P. switches for controlling immersion heaters etc. Can also be arranged with auxiliary terminals for apparatus such as pilot lights (see mounting pattress below)



13-amp flush pattern Shuttered Switch Socket with D.P. Switch; ingenious construction; dolly in best position to avoid damage



Assemblies for BS1299 & Plaster Depth installations—1 or 2 gang in one box, steel, wood or moulded



This pattress for use with 15-amp D.P. switch incorporates an earth terminal so that quick and neat connection can be made. Knockouts permit both back and side entry

IMPORTANT
With the Miniac range all necessary holes are tapped, all screws are captive—and there are hosts of other reasons why you should specify and sell Miniac

MINIAC—the largest range of A.C. switches and switch sockets

—designed in accordance with B.S.S. and I.E.E. requirements, of course!

Flush	Ceiling	Assemblies for B.S.1299 Box
Surface	Push on—Push off	5-amp to 30-amp Switches
Plaster Depth	Bell Push	5, 13 and 15-amp Switch Sockets

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AWCO

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AWCO Conductor in its various forms—Steel-cored Aluminium, Silmalec (a high tensile aluminium alloy), Steel-cored Silmalec and All-Aluminium—is available to transmit power at all voltages.

Photograph by courtesy of "Nigeria"

Erection of AWCO All-Aluminium conductor at Aiyetoro, Nigeria

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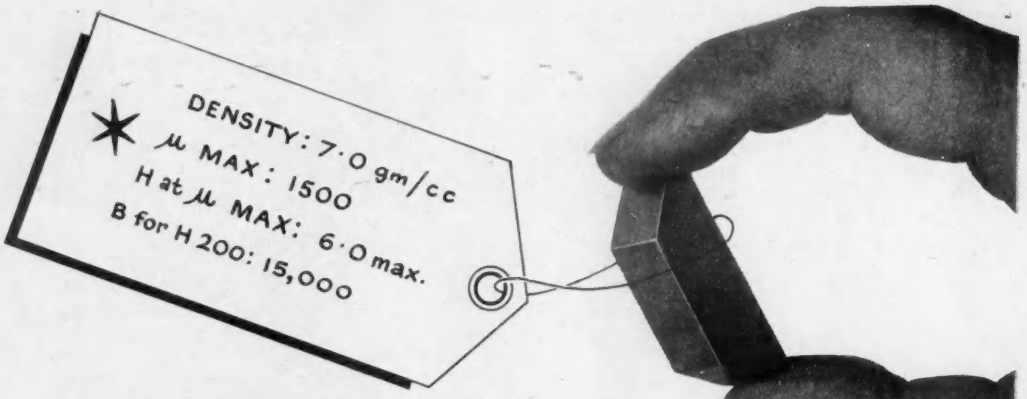

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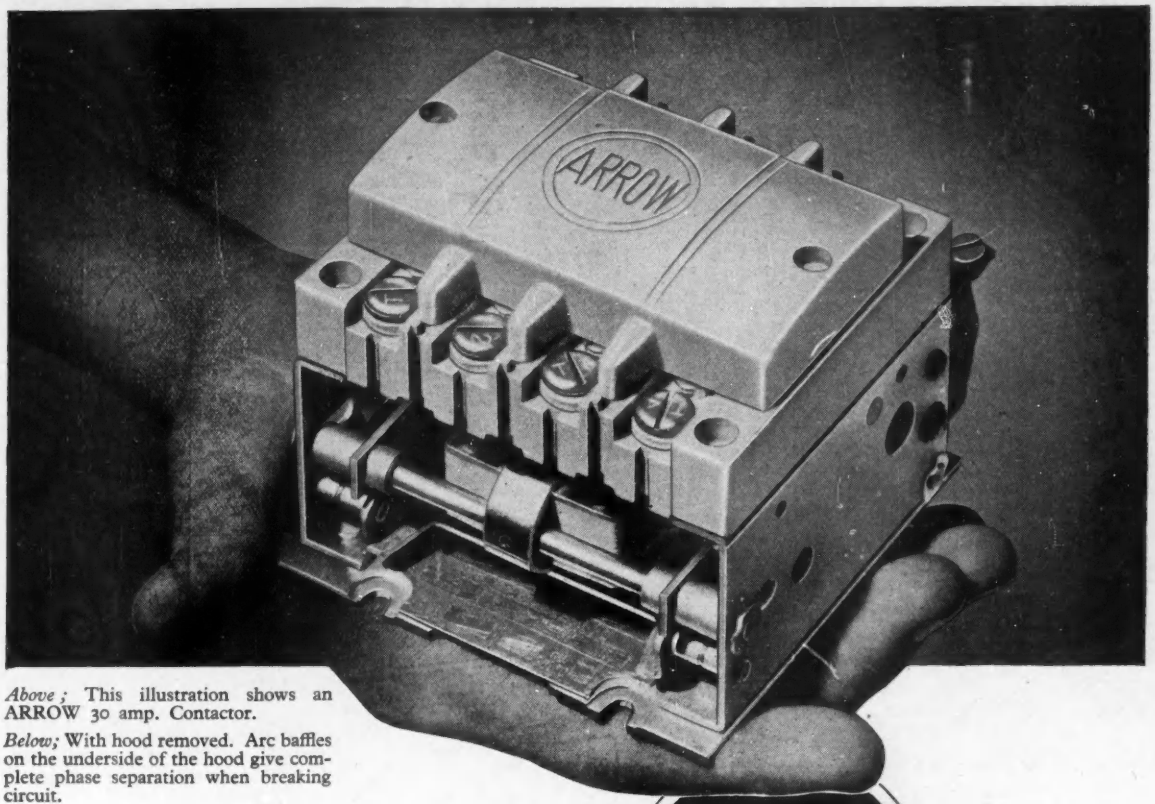
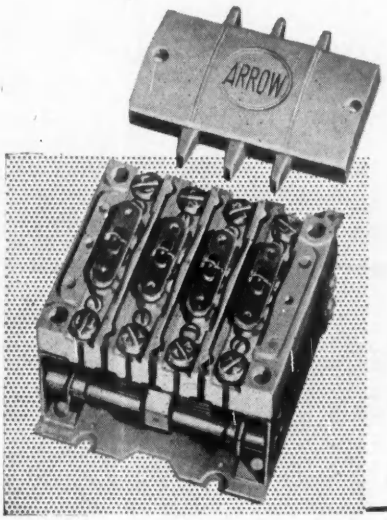


Above ; This illustration shows an ARROW 30 amp. Contactor.

Below; With hood removed. Arc baffles on the underside of the hood give complete phase separation when breaking circuit.



ARROW

Complies with B.S.S. 775 for breaking capacity • 50% saving in weight and size • Coils and contacts changed in a matter of seconds • Exceptionally low wattage consumption • "Straight-through" wiring connections • Conforms with U.S.N.E.M.A. specification • Comprehensive spares facilities in U.S.A. and Canada • Three sizes — 30, 50 and 100 Amps. at 550 Volts A/C rating • D/C ratings on request.

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- *Two boiling plates and grill-boiler*
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- *Large hotcupboard. Utensil drawer 24/- extra*
- *Exclusive full-size inner glass door*
- *Finished in white or cream vitreous enamel*

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ALCHO-RE Fluxes eliminate corrosion

The use of FRY'S Alcho-Re soldering products guarantees swift, perfectly soldered joints *with no corrosive after-effects.* Alcho-Re fluxes contain active constituents which, whilst ensuring fast, even solder-spread, eliminate entirely the dangers of dry or H.R. joints. For complete freedom from corrosion in all forms of soldering specify ALCHO-RE—by FRY'S. Export enquiries invited.

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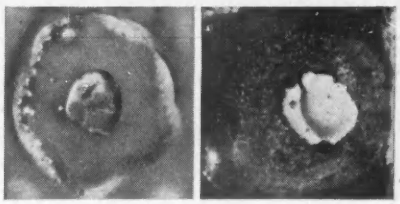

LEFT. Residue from Alcho-Re flux on soldered copper, shows no change *after three months' storage*
RIGHT. Corrosion and deliquescence are visible on the specimen soldered with an active flux *only three days after soldering.*

The Alcho-Re Range of Products include

PASTE FLUXES
SOLDER CREAMS
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All conforming to Specification DTD599

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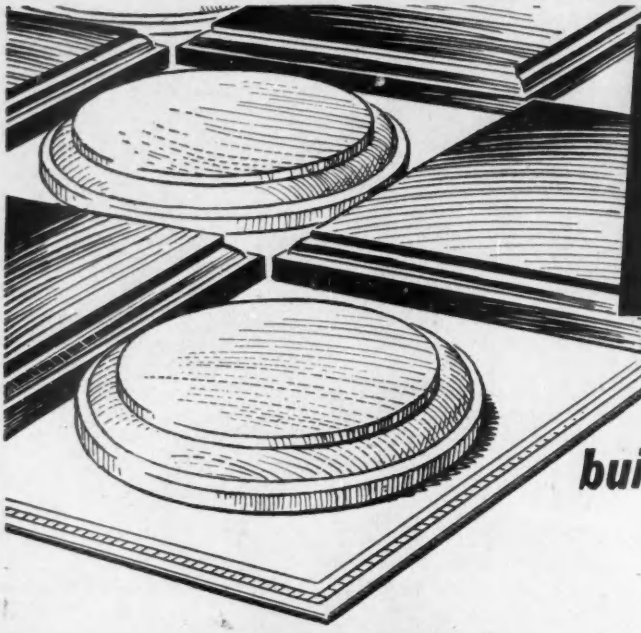

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built of* KILN DRIED *timber
STAY FLAT
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VOLT WORKS, BELFAST, N. IRELAND

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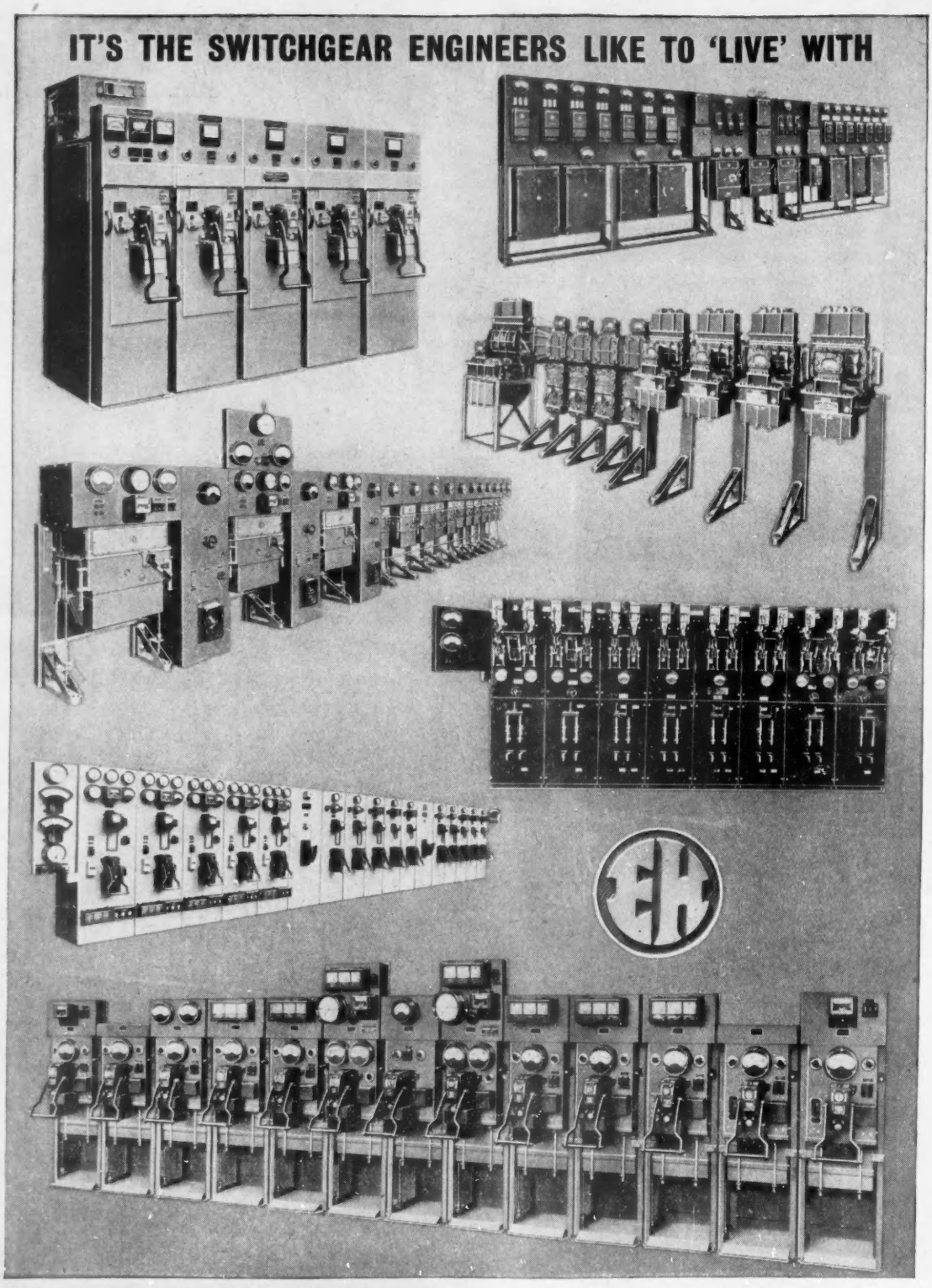

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up to 11 kv 250 MVA rupturing capacity
MOTOR CONTROL GEAR ¼/5000 H.P.

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Simplicity–

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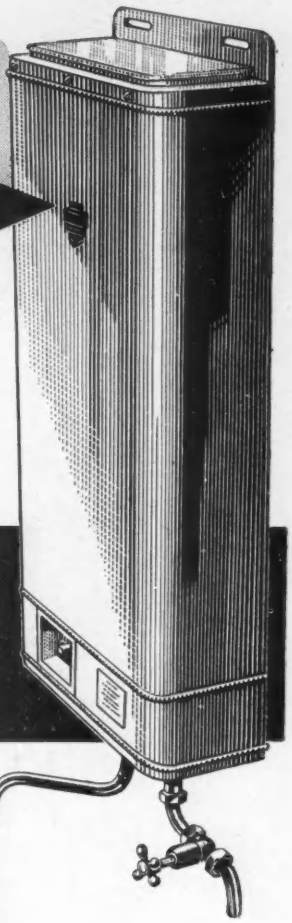
Heatrae



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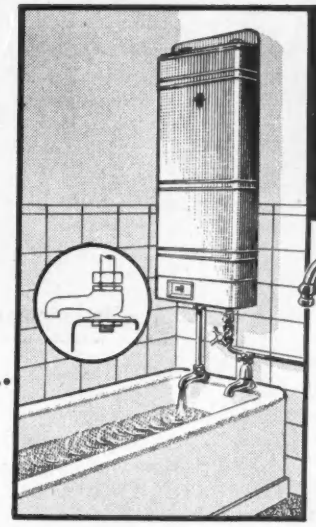
The **S.E.B.** is beautifully finished in white enamel with chromium plated fittings. Rectangular in shape, it occupies minimum space.

Capacity: 12 *gallons.*

This is one of a wide range of Heatrae Electric Water Heaters.

There is a standard type available to meet almost any set of working conditions.

Please send us details of your requirements and we will make you the most suitable offer.



so simple to **install**

so simply **serviceable**

are so simple...

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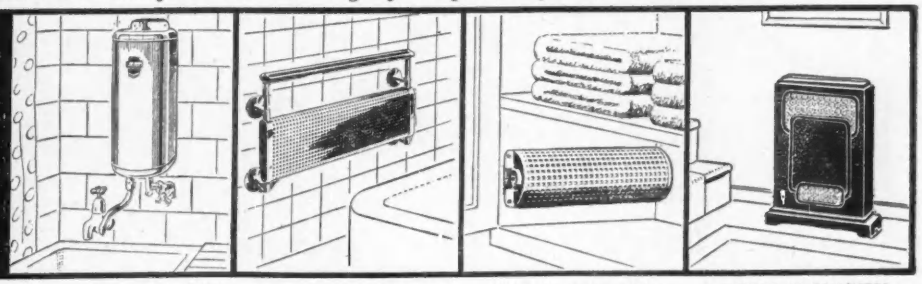
30 years specialised experience in designing and manufacturing of Electric Water Heaters

Here are some of the extensive range of our products for industrial and domestic uses . . .



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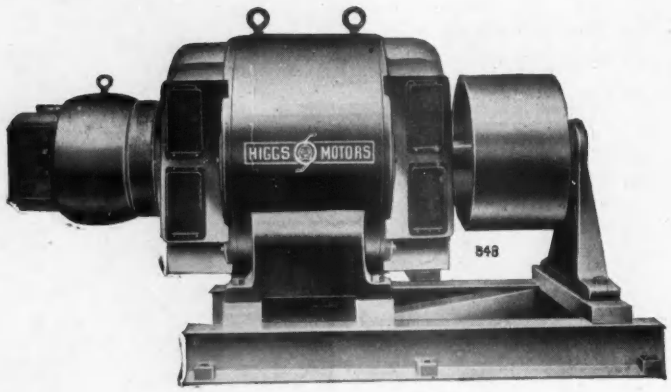

500 kVA.
A.C. GENERATOR

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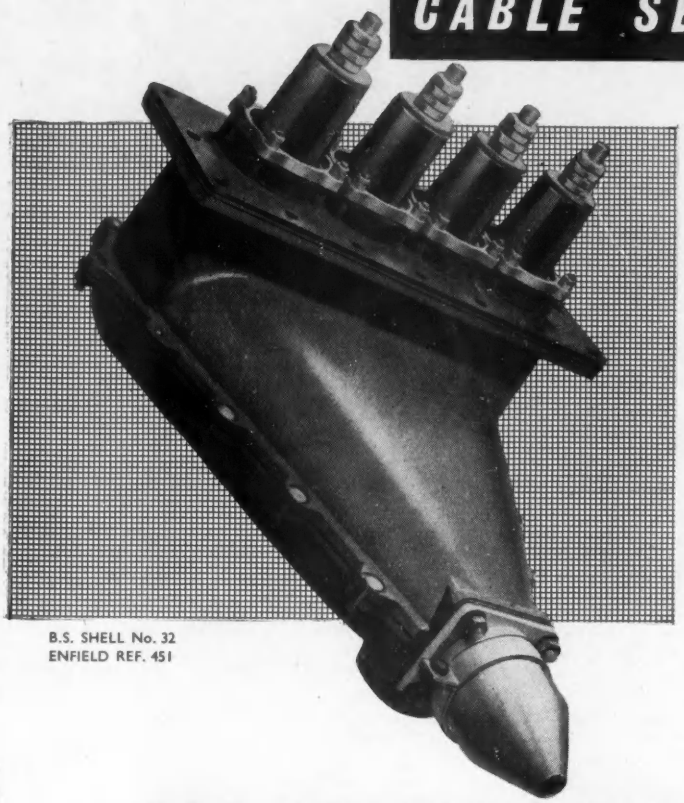
CABLE SEALING BOXES

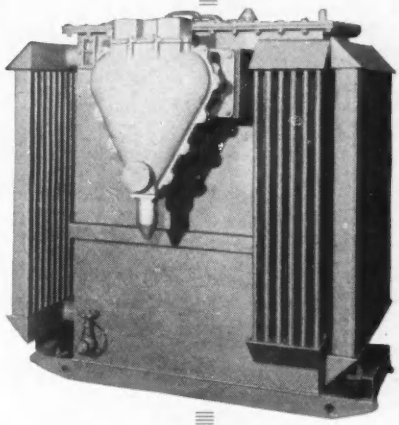


B.S. SHELL No. 32
ENFIELD REF. 451

. . . FOR TRANSFORMERS

STANDARDISED TO COMPLY WITH THE B.E.A. TRANSFORMER SPECIFICATION T.1. APPENDIX C AND BS. 171/1936

Enfield Cables manufacture transformer boxes for voltages up to and including 11 kV. All boxes may be used in indoor or outdoor transformers and are suitable for top or bottom entry by lead-covered or aluminium-sheathed cables, with wiping glands. For use with multicore cables, the gland is uninsulated and provided with armour clamp, while for single-core cables the gland is insulated, but with provision for earthing.



A 200 kVA 11000/433 V distribution transformer manufactured by Fuller Electrical & Manufacturing Co. Ltd., fitted with an Enfield Transformer Cable Sealing box.

Please write for further information:

ENFIELD CABLES LIMITED, VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1

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Enfield

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COXOHM AUTOMATIC VOLTAGE REGULATOR

- Suitable for large A.C. or D.C. machines.
- Possesses extreme sensitivity.
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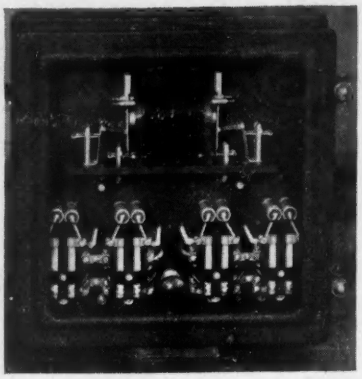

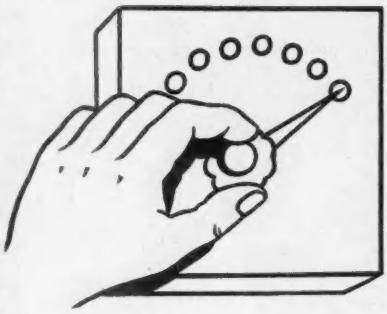

As specialists in the field we shall be pleased to advise on the question of automatic voltage regulation if we may receive particulars of your specific requirements for any loading.

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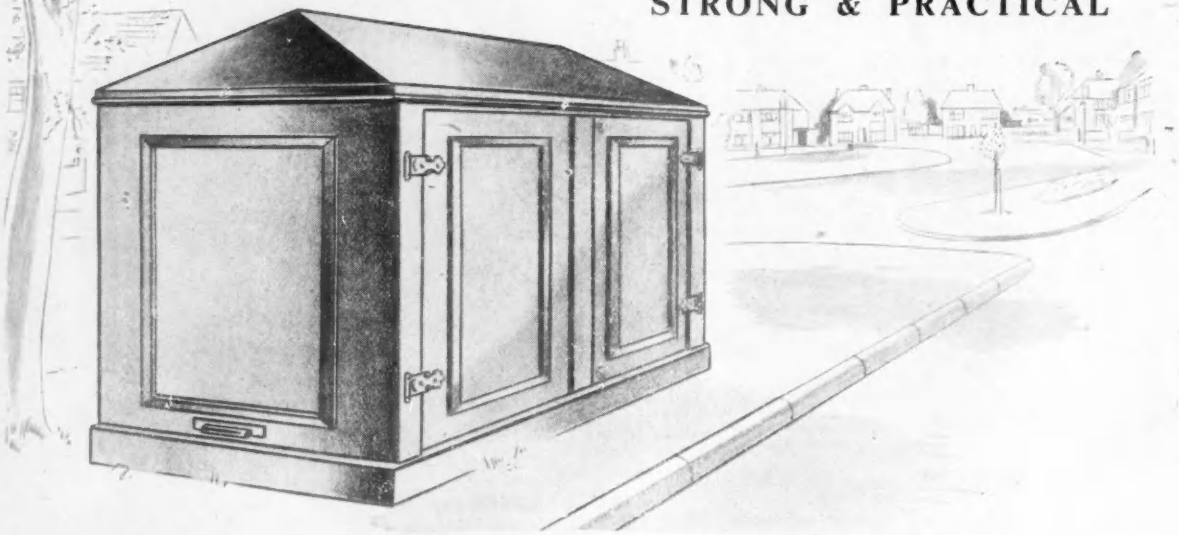

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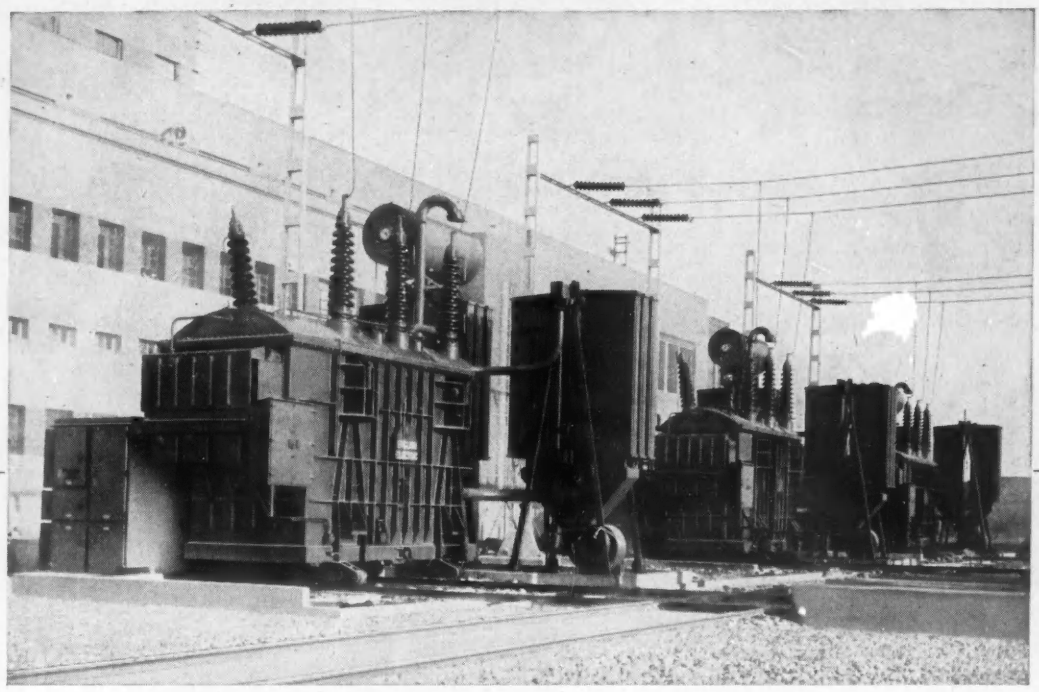
M.W.110

Generator Transformers in Spain



The three 'ENGLISH ELECTRIC' 31,250 kVA, 138,000/10,500 volt, three-phase generator transformers illustrated, are installed in Spain.

The ENGLISH ELECTRIC Company designs and manufactures transformers of all types, up to the largest size and highest voltage.

'ENGLISH ELECTRIC'
transformers

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Transformer Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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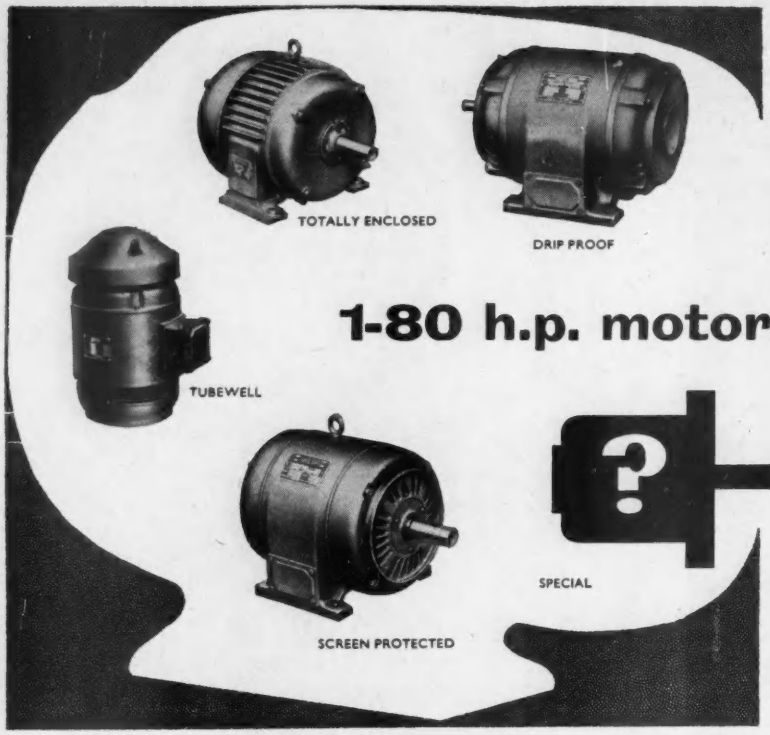

At Cardiff, Brush make their range of smaller motors, from 1 h.p. babies to middleweights with 80 h.p. on the shaft. If your needs come anywhere within

1-80 h.p. motors by BRUSH

this range they'll have the answer at Cardiff: slipring or squirrel cage, conforming to BSI, CSI or NEMA standards. And if yours is a case for a 'special', it may already be among our existing types. If not, we shall be pleased to consider your particular requirements. Write for full details and Publication No. 11002.

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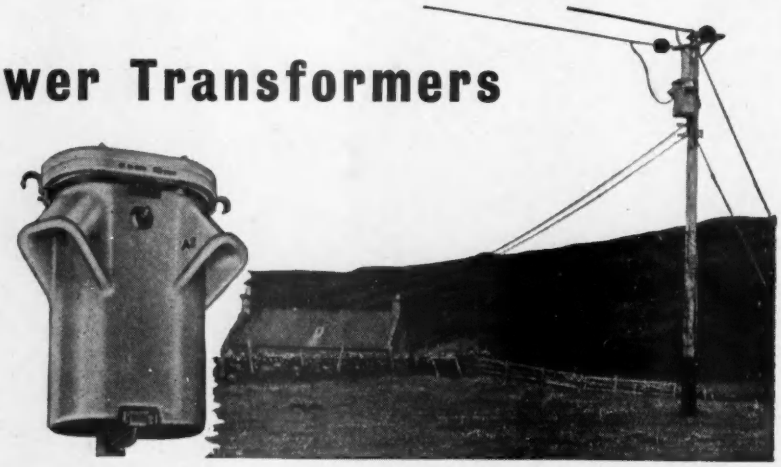
British Power Transformers

for rural distribution

in hermetically-sealed stoneware containers



Photograph by courtesy of British Insulated Callender's Construction Co. Ltd. and the North of Scotland Hydro-Electric Board.

- No maintenance costs. Containers are salt and acid proof. Supporting steel work is heavily galvanised. Hermetically sealed container protects oil from acidity.
- Increased efficiency and reduced operating costs due to low losses.
- High Overload Capacity.
- Simple installation—only one or two bolts required. Other types of distribution transformers, including units to the Draft National Standard Specification T.1. in steel tanks, can also be supplied.

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* * *

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THE CRESSALL MANUFACTURING CO. LTD.
TOWER STREET · BIRMINGHAM 19

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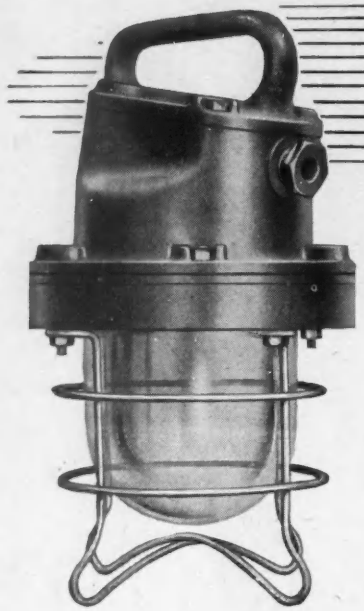

Always in the forefront, anticipating lighting requirements, Heyes have been making handlamps for 20 years. Illustrated is the standard unit fitted with Porcelain B.C. Lampholder, for use with a T.R.S 3 core individually screened cable (supplied if desired). The cable enters the handlamp through a packed gland and the screens are clamped inside the joint box, where an earthing terminal is provided.

40/60 WATT
FLAMEPROOF HANDLAMP

FLP 3213 Groups II & III

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to Differ also
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LOCKS

for Prepayment Meters Switchgear,
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The installation of Dubilier Capacitors for power factor correction, effects such substantial saving in cost of power that the capital outlay is recovered in a short period of time. Occupying minimum floor space and requiring no maintenance, Dubilier Power Factor Correction Capacitors are absolutely reliable. Is there room for such improvement in *your* factory? Our engineers will carry out a full investigation of your present power factor and advise you without cost or obligation.

A small factory installed a Dubilier Capacitor to correct their power factor from 0.68 to 0.95, thus reducing their maximum demand from28kVA to 20kVA.

Cost of Power

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Before installing Capacitor	276	12	0
After installing Capacitor	228	12	0
Saving per annum	**48**	**0**	**0**

Approximate cost of Capacitor equipment £65.0.0 thus paying for itself in little over a year.

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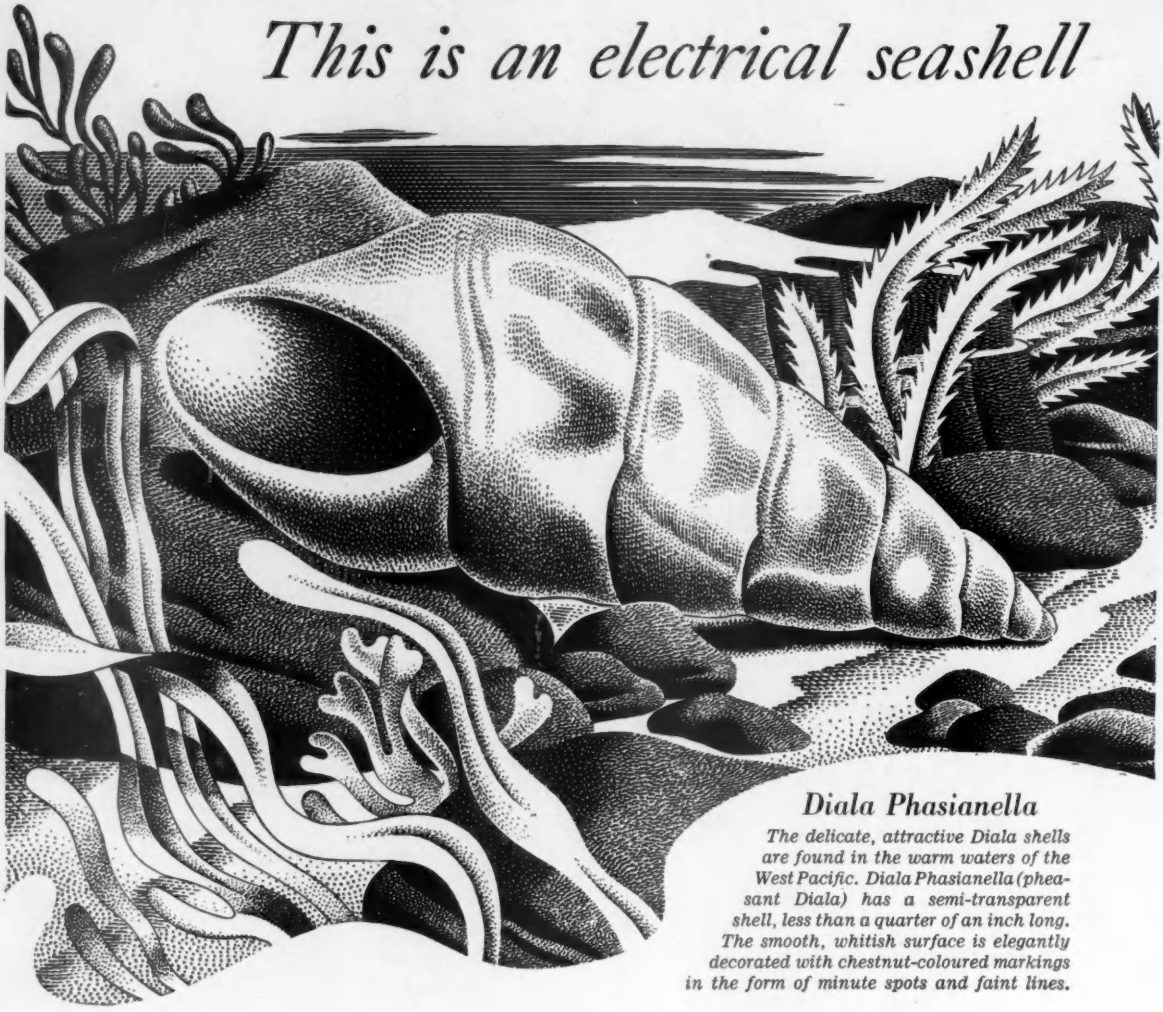
Phone: Acorn 2241 (5 Lines). Grams: Hivoltcon, Wesphone, London. Cables: Hilvoltcon, London. Marconi Inter. Code.

D98B

This is an electrical seashell



Diala Phasianella

The delicate, attractive Diala shells are found in the warm waters of the West Pacific. Diala Phasianella (pheasant Diala) has a semi-transparent shell, less than a quarter of an inch long. The smooth, whitish surface is elegantly decorated with chestnut-coloured markings in the form of minute spots and faint lines.

Shell Diala Oils are specially designed for transformers, oil-filled switchgear and capacitors, and for general insulating and dielectric purposes. Shell Diala Oil B complies with British Standard Specification 148/1951.

Shell Diala Oils

SHELL

LEADERSHIP IN LUBRICATION

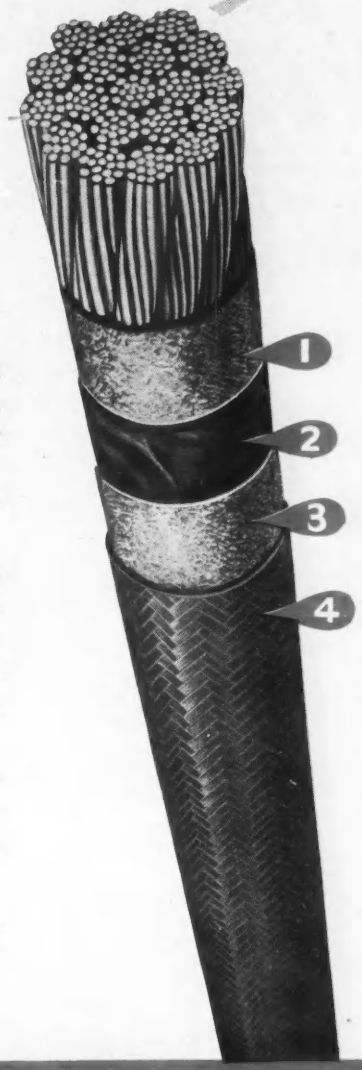
This is the cable for HOT SPOT installations

because

★ . . . the insulation will not burn or carry flames . . .

★ . . . resists moisture, grease, oil and corrosive fumes . . .

★ . . . it is designed to withstand high ambient temperature and overload heating.



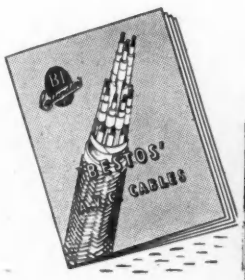
BESTOS A.V.C. Cables can save you time, money and maintenance headaches. They're made to withstand *continuous* high temperatures under the toughest working conditions—where other available types of cable would rapidly deteriorate.

See from their construction why they are the obvious answer to Hot-Spot problems.

The Varnished Cambric insulation (2) is protected against high conductor temperatures by an inner layer of asbestos felting (1). Second layer of asbestos felting (3) protects the insulation from ambient heat and oxidation. Tough outer braid of impregnated asbestos yarn (4) gives extra protection against heat, flame, moisture, grease, oil and corrosive fumes.

BESTOS Cables are available in single and multi-core types for service up to 6,600 volts. Let our engineers give you further information—or advise you on the best use of BESTOS for your Hot-Spots.

Send for publication No. 318 giving further information on BICC Bestos AVC Cable.



BICC BESTOS
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BI Callender's

BRITISH INSULATED CALLENDER'S CABLES LIMITED
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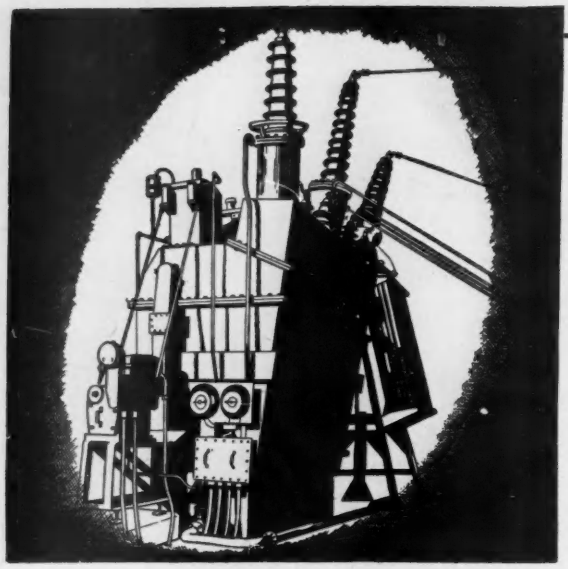

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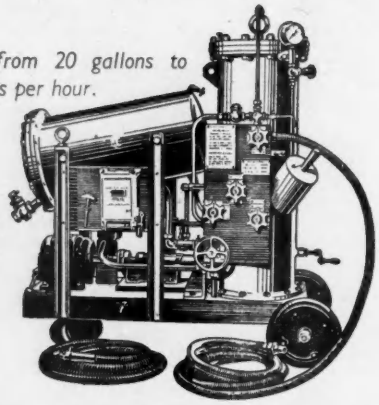
Complete Drying and Purification giving Maximum Breakdown Voltage in one simple operation. No heating. No fire risk. Weatherproof. Fully mobile units. Used by leading Electricity Undertakings throughout the World.

Capacities from 20 gallons to 1,000 gallons per hour.



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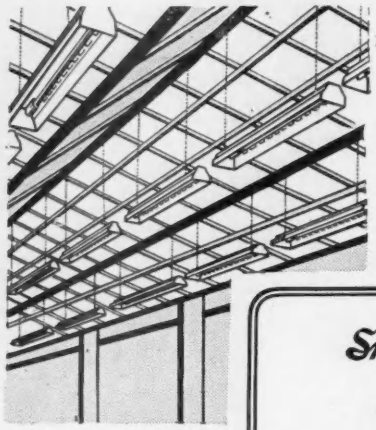
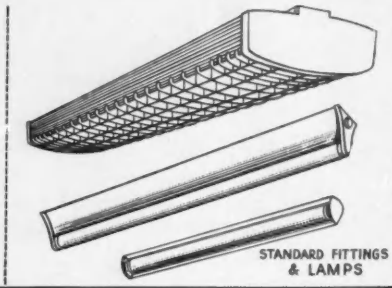
THE METAFILTRATION COMPANY LIMITED
BELGRAVE ROAD, HOUNSLOW, MIDDLESEX

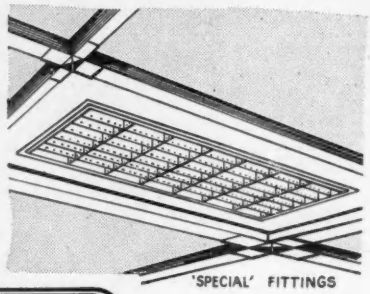
★ *PHONE: HOUNSLOW 1121/2/3*
GRAMS: METAFILTER, HOUNSLOW



COMPLETE LIGHTING SCHEMES



STANDARD FITTINGS & LAMPS



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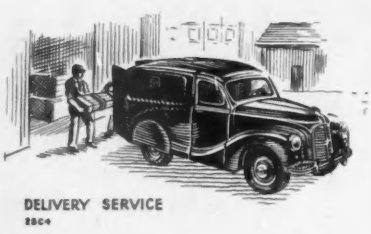
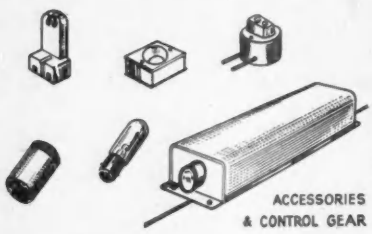


DELIVERY SERVICE



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OVERHEAD CABLES

These Plastic Insulated Overhead Cables to G.P.O. Specification and D.E.F.9

We are the pioneers and Designers of these special cables in conjunction with the G.P.O. and B.E.A.

THERMOPLASTIC INSULATED POWER CONDUCTORS at Crossings of Post Office Communication Circuits and Power Lines are readily available

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WANDLESIDE are fully POST OFFICE approved on these Cables and have undertaken the RESEARCH and Design of the Prototypes

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Available in TWO sizes

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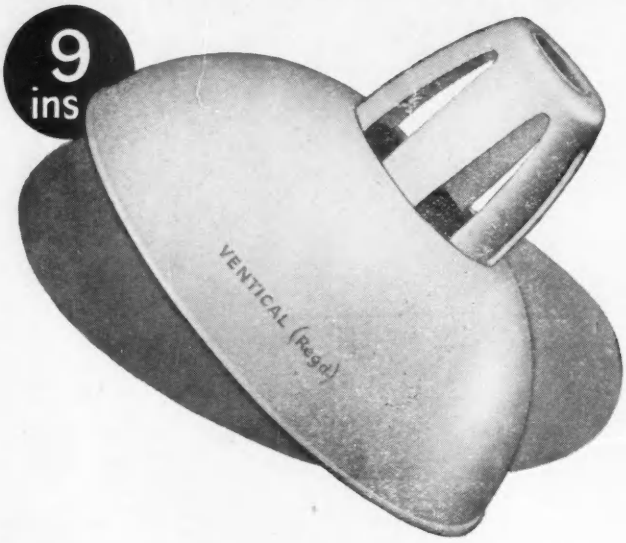

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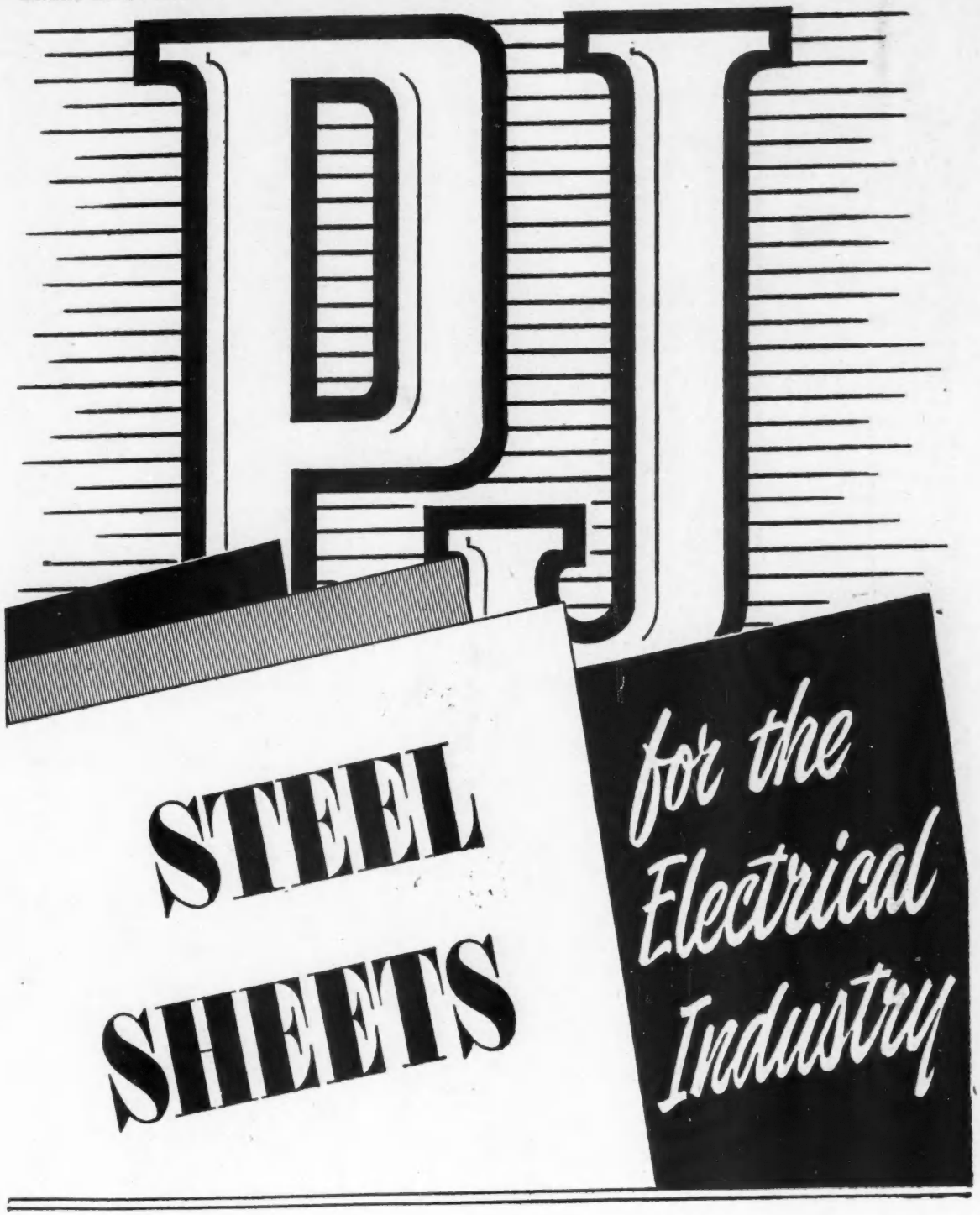

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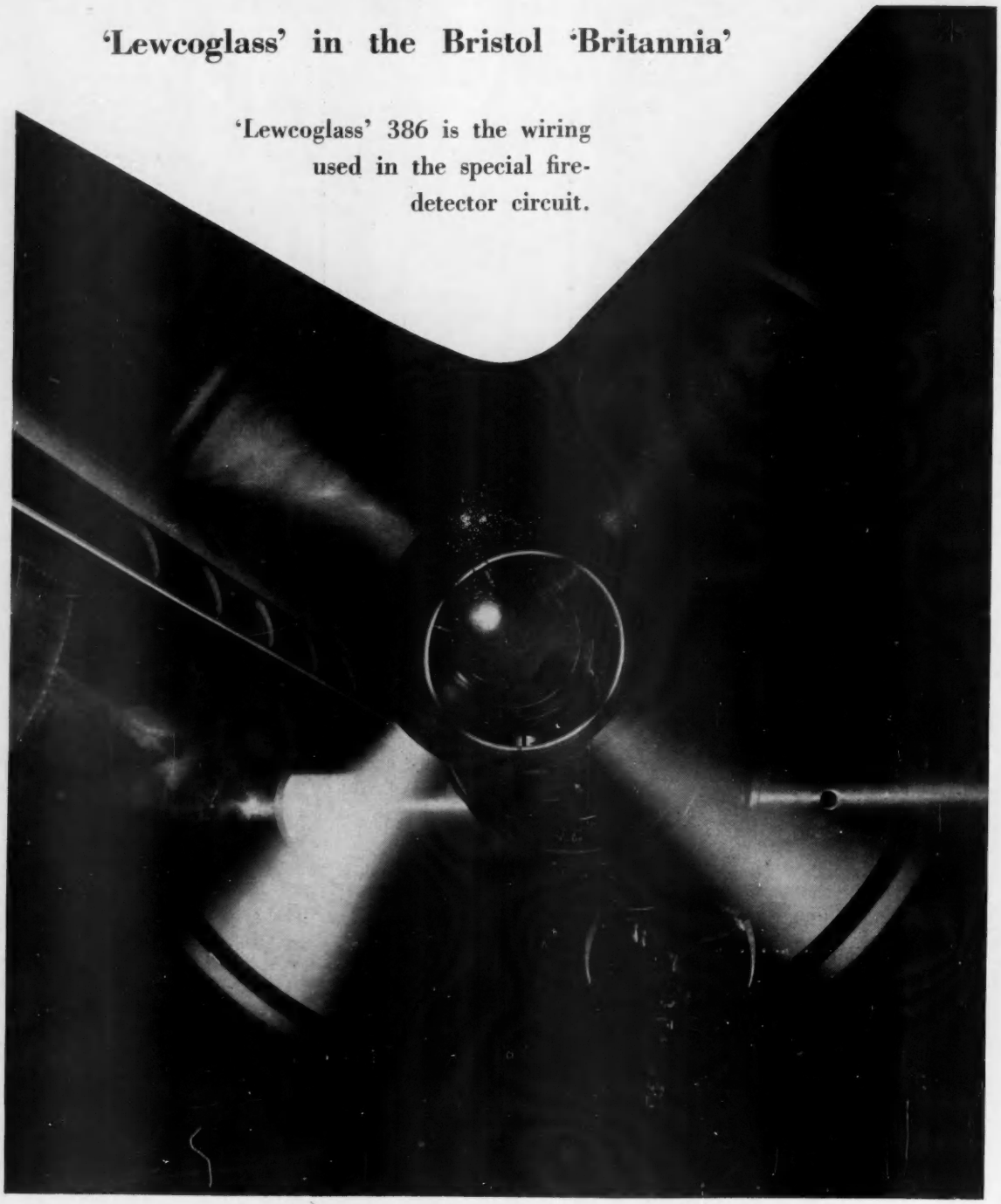
'Lewcoglass' in the Bristol 'Britannia'

'Lewcoglass' 386 is the wiring used in the special fire-detector circuit.



'Lewcoglass' 386 a silicone bonded, glass braided and taped, tinned copper flexible, has the approval of the Ministry of Supply, Air Division, to their specification EL 1736. This type has been designated by them Unifiredet 7.

Technical information and data available upon request.

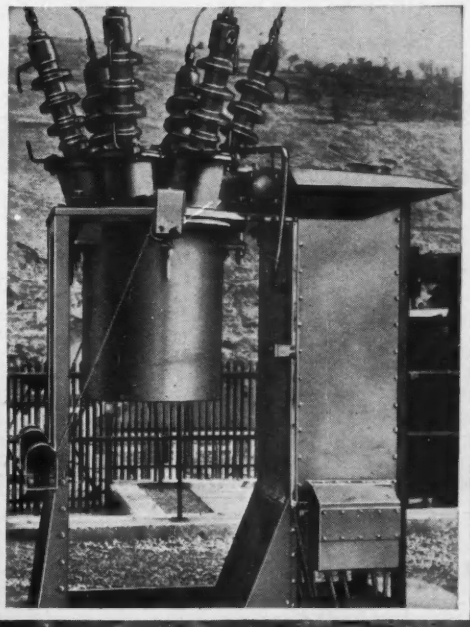
THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED, LEYTON, LONDON, E.10

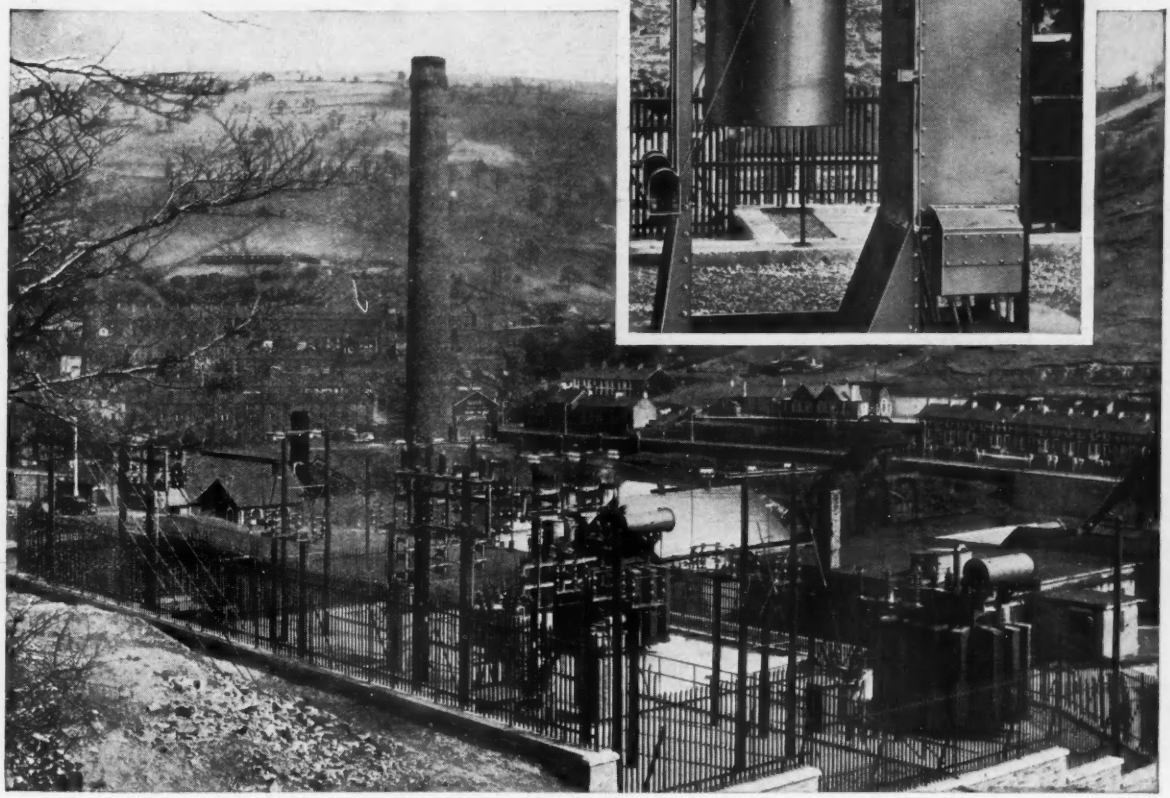
Incorporating Frederick Smith & Company, Associated with The Liverpool Electric Cable Co. Ltd., and Vactite Wire Co. Ltd.

33kV OUTDOOR SWITCHGEAR

A Monmouthshire colliery sub-station equipped with S.W.S. 33,000-volt, 500-M.V.A outdoor oil circuit breakers.

CERTIFIED TEST PERFORMANCE AT 33kV : 50 TO 1,000 M.V.A.





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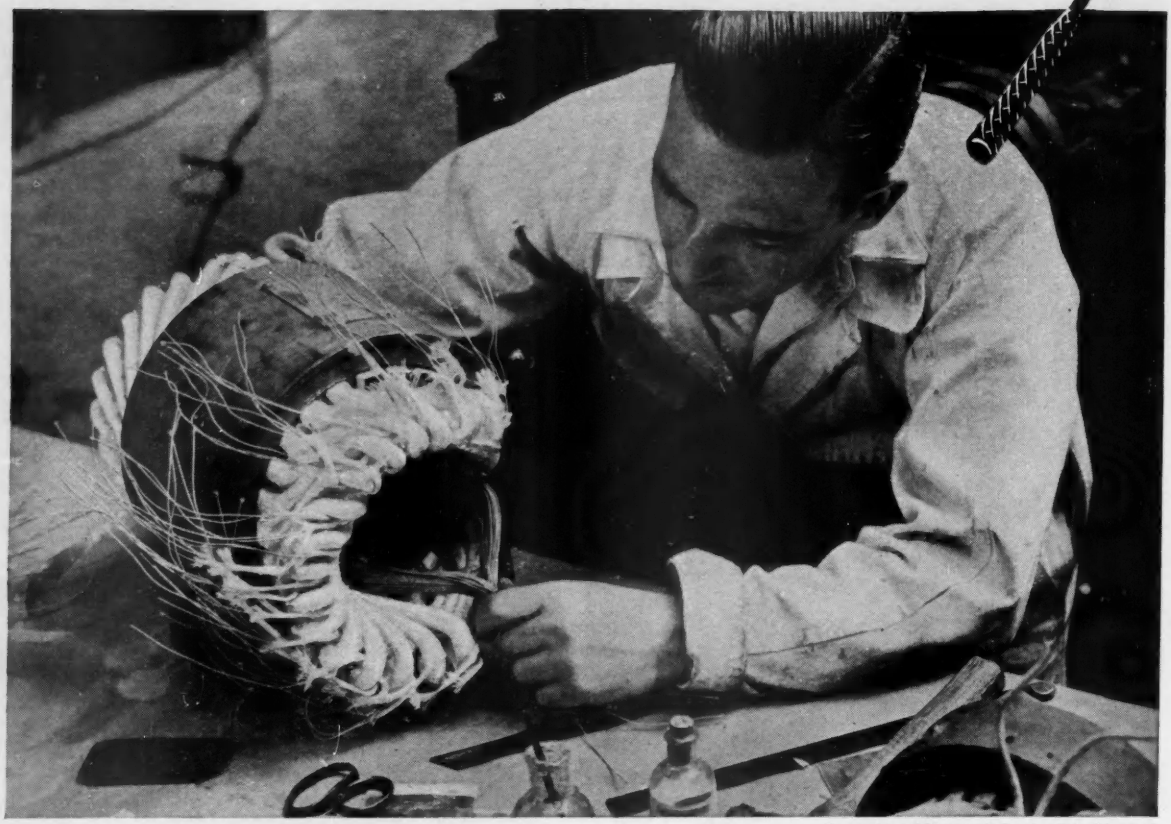

By courtesy of Massey & Coggins Ltd., Liverpool

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SILICONES provide a greatly improved form of insulation for the rewinding of all motors, transformers or other equipment operating in difficult conditions. Rewind companies who are able to carry out silicone rewinds are finding that their reputation is enhanced and volume of business increased, because they offer a new and essential service to their customers.

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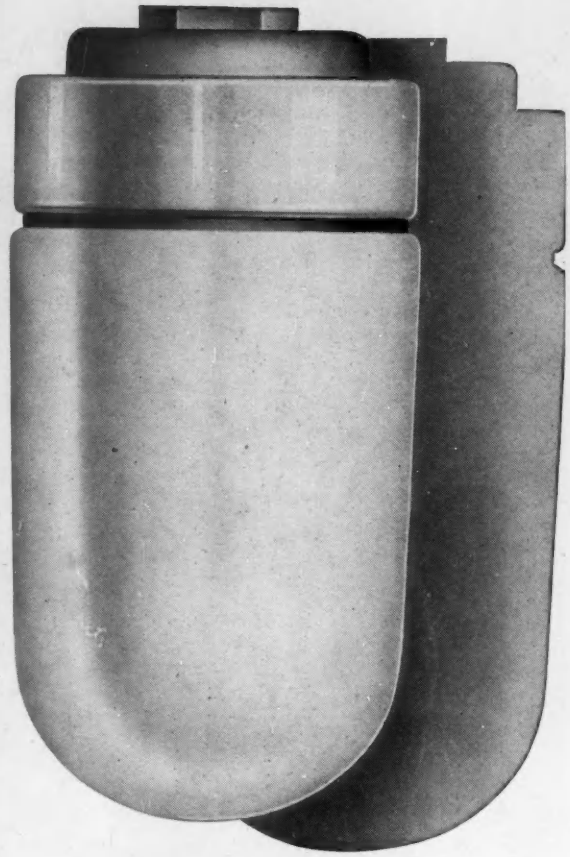

. . . *that the*

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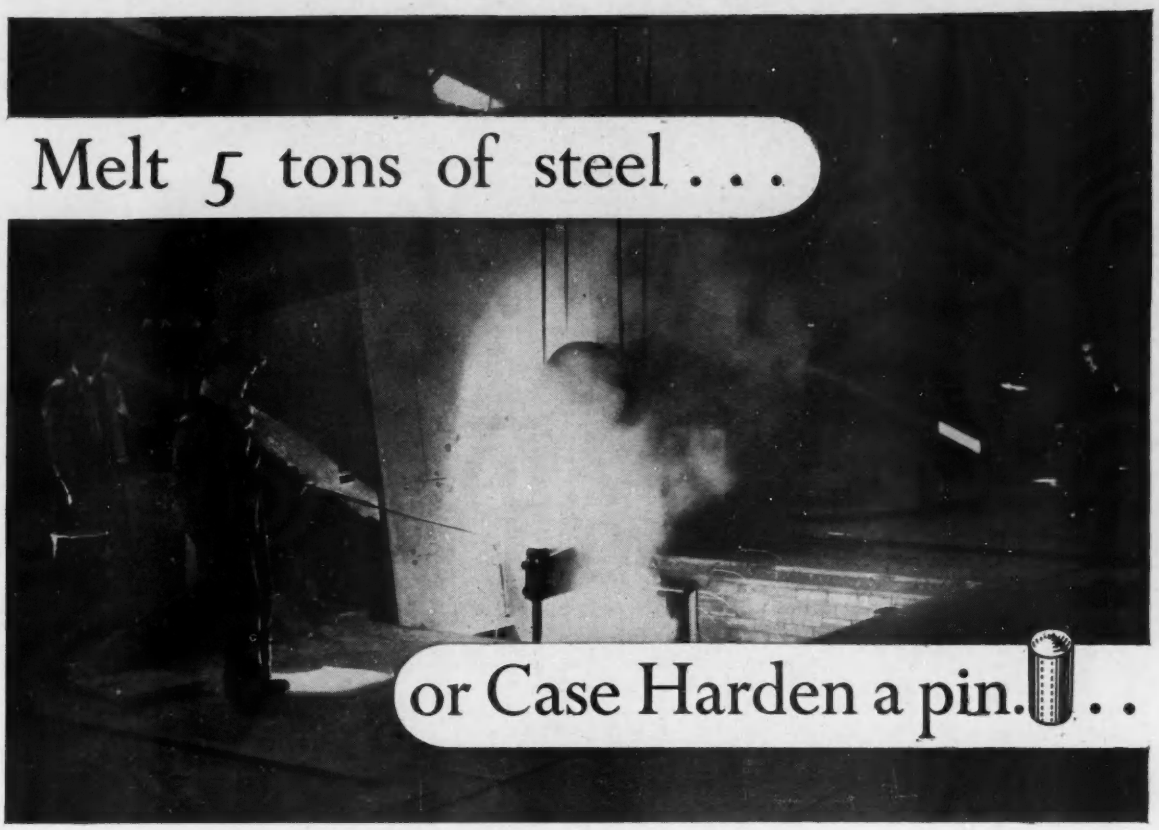
NON-CORRODIBLE WATERTIGHT FITTING

saves time and money in erection and re-lamping . . . and costs nothing whatever for maintenance

Leaflet No. P.9512 gives details of the 60 watt, 100 watt and 200 watt range of Fittings

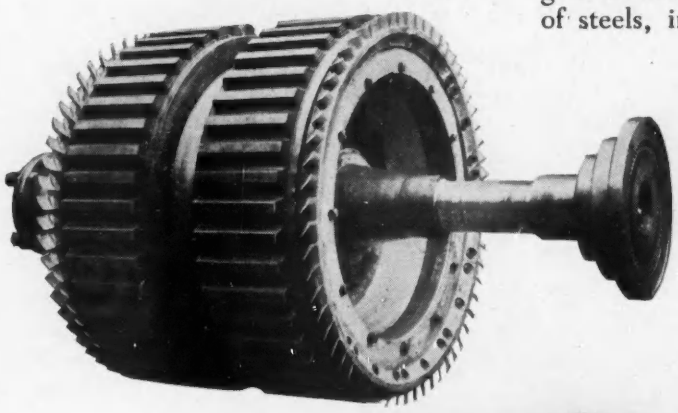
Patent No. 568702

Issued by Rowlands Electrical Accessories Ltd., R.E.A.L. Works, Birmingham 18



. . . with METROVICK Induction Heating

The Metrovick range of equipment for electric induction heating extends from small laboratory apparatus operating at frequencies of 100/1,000 kc/s to equipment for 5 ton steel furnaces powered by 1,500 kW H.F. generators. In general industry, as well as in the heat treatment of steels, induction heating offers the prospect of improved output, lower operating costs and higher efficiency. For case hardening or annealing small metal parts, and many applications requiring rapid heating on a mass production line, suitable H.F. or R.F. equipment can be supplied by Metropolitan-Vickers.



A 2-core rotor for a Homopolar generator. Metrovick supply a full range of H.F. motor generator sets up to 10,000 c.p.s. for heavy duty induction furnaces.

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ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER 17

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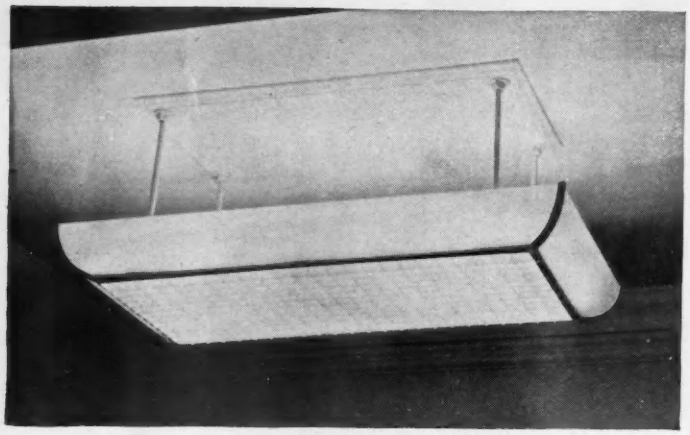

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'Perspex' is the registered trade mark of the acrylic sheet manufactured by I.C.I.

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FP. 26

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wash boilers
new editions of
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VERSCO ROUND BOILER

VERSCO SQUARE DE LUXE BOILER. This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

VERSCO ROUND BOILER. Obtainable in Galvanised finish as shown (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

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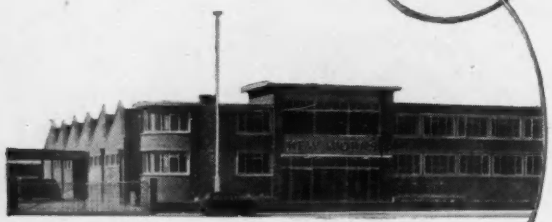

Kent Bros. Electric Wire Co. & E.H. Phillips Limited

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DESIGNED for use under conditions of **SHOCK** and **VIBRATION**

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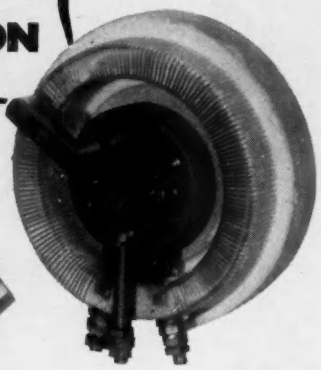
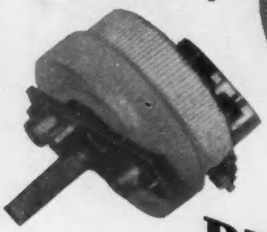


Size R.T. 50 Type Embedded of 50 wts. rating



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The ASEA Lightning Arrester is unrivalled for plant protection and service reliability. The Arrester comprises a number of spark gaps connected in series with a resistor of non-linear type.

Outstanding features of the ASEA Lightning Arrester are :

1. Low spark-over level at high impulse steepness.
2. Low discharge voltage.
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4. Filled with pure dry nitrogen at atmospheric pressure and hermetically sealed.
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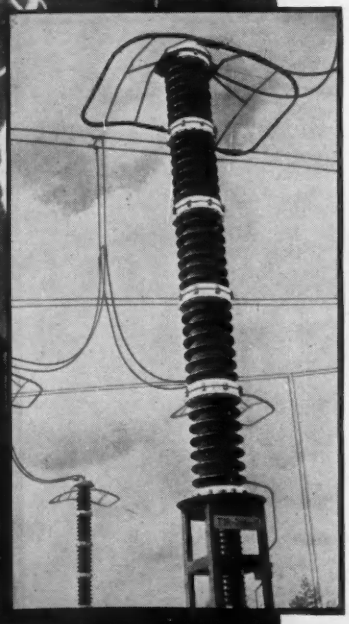
Standard Arresters for both D.C. and A.C. networks up to 160,000 volts are held in stock. Quick delivery can be offered for other Arresters.

Write for technical literature and for our Reference List of ASEA Arresters installed throughout the World.



380kV Lightning Arrester type XRSC.

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2	3.54	5.00	6.12	7.07	8.66
3	2.89	4.08	5.00	5.75	7.07
5	2.24	3.16	3.88	4.77	5.48
7.5	1.82	2.58	3.16	3.65	4.47
10	1.58	2.24	2.74	3.16	3.88
15	1.29	1.83	2.24	2.58	3.16
25	1.00	1.41	1.73	2.00	2.45
50	.707	1.00	1.23	1.41	1.73
75	.578	.818	1.00	1.15	1.41
100	.500	.707	.866	1.00	1.23
150	.408	.575	.707	.818	1.00
200	.354	.500	.612	.707	.866
350	.268	.378	.463	.535	.655
500	.224	.316	.388	.447	.548
1,000	.158	.224	.274	.316	.388

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* MAXIMUM ELECTRICAL PERFORMANCE
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* CAN BE USED IN TROPICAL SITUATIONS WITHOUT MODIFICATION

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THE BRITISH ELECTRIC RESISTANCE

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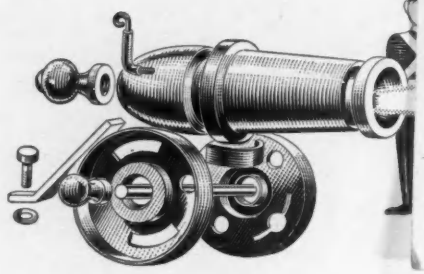

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10	1.58	2.24	2.74	3.16	3.88
15	1.29	1.83	2.24	2.58	3.16
25	1.00	1.41	1.73	2.00	2.45
50	.707	1.00	1.23	1.41	1.73
75	.578	.818	1.00	1.15	1.41
100	.500	.707	.866	1.00	1.23
150	.408	.575	.707	.818	1.00
200	.354	.500	.612	.707	.866
350	.268	.378	.463	.535	.655
500	.224	.316	.388	.447	.548
1,000	.158	.224	.274	.316	.388
1,500	.129	.183	.224	.258	.316
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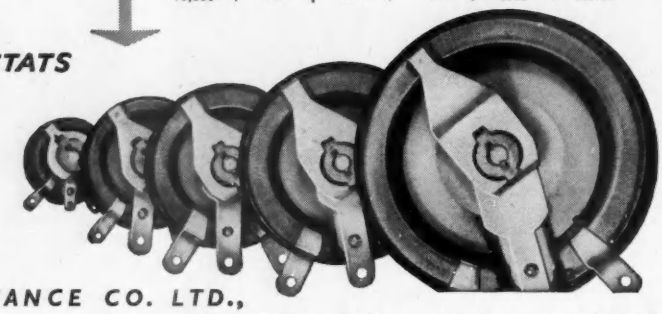

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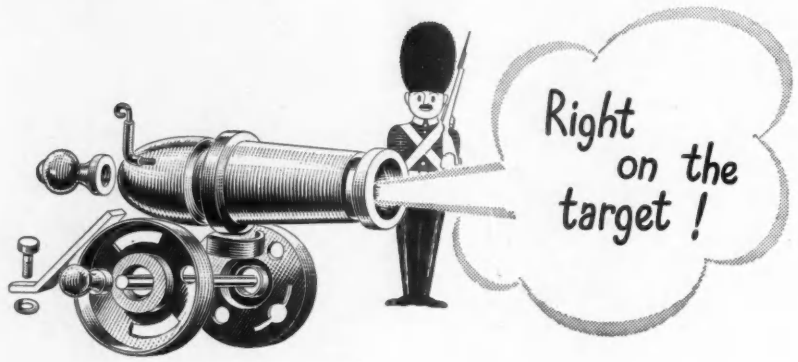

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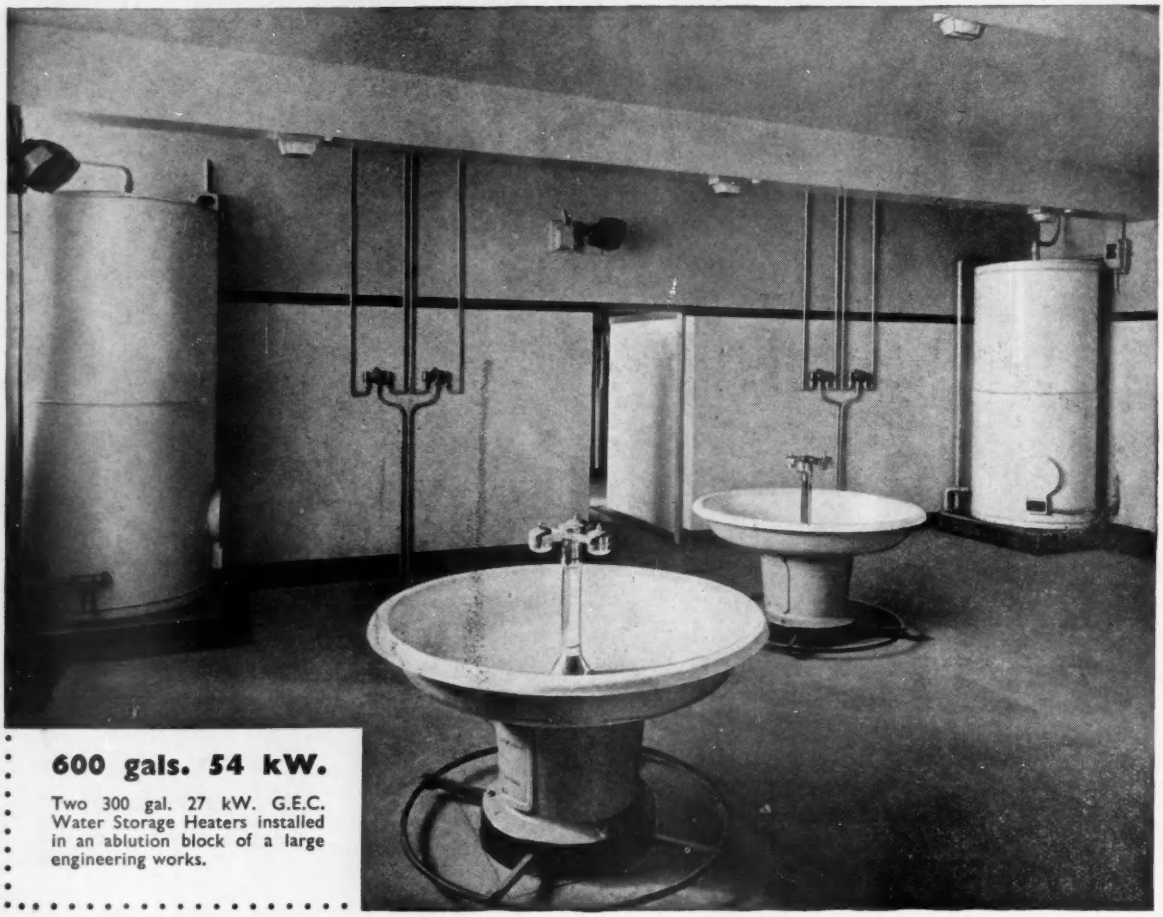

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INSPECTION BY CONTRACT

Eighteen per cent of all fires in buildings in this country during 1952 are attributed to electrical apparatus or wiring. Since the total fire loss for that year has been estimated at £24 millions, it is apparent that close attention needs to be given continually to the ways in which the number of electrical fires can be reduced. So far as apparatus is concerned, much has been achieved by extended use of built-in thermostatic devices, and these have been of particular value in motor-driven appliances and in radio and television sets. For wiring as a whole, however, the chief hope lies in good initial design of each installation, and then in regular inspection and testing. In a well run industrial establishment this is, of course, routine, but how much more might be done in houses and flats and in offices. In these, electricity is too easily taken for granted. Over the years, wiring and accessories deteriorate, and a leakage too small to blow a fuse may grow unnoticed until it initiates a fire: and "wires and cables" accounted for nearly 6% of all fires. To what extent is the answer to be found in some form of inspection and maintenance contract for domestic and commercial installations, providing for a periodic survey of all that is electrical in a house or office? The idea has been discussed before in these columns, and it was interesting to find it receiving some support at the B.E.P. Convention, when Mr S. L. M. Barlow, dealing with the discussion on his paper, agreed that the question of maintenance needed to be dealt with most urgently, and suggested that the domestic maintenance contract might be a coming thing.

CONSUMPTION IN WINNIPEG

Fresh from Eastbourne with thoughts of the discussion on load development, we received a severe reminder of the ultimate possibilities of load growth from the annual report of the City of Winnipeg, which showed that the average sales per domestic consumer last year exceeded the exceptional figure of 7,000 units. What is more, even at this level, domestic load is continuing to grow between four and five per cent per annum. Winnipeg has, of course, the advantage of hydro power with an average price for units sold to domestic consumers of about five-eights of a penny, which bearing in mind the higher cost of living in Canada is relatively much lower than in this country. While a high level of consumption is typical of most hydro-electricity undertakings, the Winnipeg figures are especially valuable for the breakdown of usage that is provided. Quite clearly the dominant factor is the

heavy water heating load which accounted for over 60% of domestic sales, with an average consumption of 9,151 units a year where water heaters and cookers were installed. Equally spectacular, and perhaps even more significant, was the average domestic consumption for lighting alone, which amounted to no less than 1,430 units per annum, a figure even greater than the 1,350 units per domestic consumer sold for all purposes by our Area Boards. While the differing circumstances existing in Winnipeg invalidate any direct conclusion relevant to this country, the figures are suggestive of possibilities that can be reached in domestic lighting, a field in which electricity faces no competition and perhaps in consequence is one which tends to be neglected for the water heating and cooking loads.

AN EXPORT WEEK

Electrical exports were in the news last week with a success and a failure that colour with vivid immediacy some of the points made at the recent British Electrical Power Convention. To obtain customers, it is necessary to help finance them, was Mr. Beard's message at the Convention, and willingness to do this has secured an order from Greece worth over £5 millions, which is hailed as the largest single order placed by that country with a British firm since the war. This achievement does underline the value of risk-taking: for the sake of the country's exports there needs to be more willingness by banks and other finance organisations to match in this way the technical skill and sales enterprise of electrical manufacturers. Yet enterprise and price advantage may not be sufficient. The Greek success was counterbalanced in some degree by the failure of the week, following a new application of the "Buy American" Act in its full stringency across the Atlantic. The almost notorious Chief Joseph Dam is one of two projects concerned where British bids were lower—but not low enough to compel the U.S. Government Agency concerned to buy. The hopes raised by the report of a recent official commission, that the 25% margin rule would be abandoned seem premature when actions rather than words are taken into account.

HEAT PUMP PROSPECTS

Heat pumps have graduated this year from the position of a bright scientific idea with an uncertain future to that of commercial reality. Development of the combined refrigeration-water heating unit has given them a role fitted to the British climate, and the problem of securing their widespread application now moves to the selling field. How are they likely to fare in today's fierce competition for the householder's money? The first difficulty arises in the very idea of combined heating and cooling. It has too facile a probability, and will demand clever publicity if the public is to be convinced that there is no "catch in it." In this respect, solid support by the area boards may prove decisive and with the high load factor the heat pump can offer, they will presumably welcome it as a load and assist in promoting it. In the long run, however, much will depend on the success of early installations, and the need here is for a technical sales and advisory service of the highest standard. The installation of a heat pump in new houses requires careful co-ordination of the heat services while to fit in with existing kitchen layouts without serious disturbances of general temperatures, requires a deal of ingenuity based on a sound appreciation of the principles involved. It is not too early to make a start on disseminating the necessary information to showroom staffs.

SAFETY WITH HYDROGEN

For the purposes of the Factory Acts, power stations are factories, and so are substations and many other installations on distribution systems. From this fact of law springs the unusual prominence with which the industry figures in the latest report of H.M. Chief Inspector of Factories. By and large, the result of this survey is reassuring, but in view of recent events, there is special interest in the extensive attention the report gives to hydrogen cooled alternators. It is emphasised that from experience it is hardly possible to suggest that the risk of an explosion resulting from this use of hydrogen is serious: but evidence is quoted to support the contention that the chances of a major explosion within the hydrogen system are more real than was originally realised, and the recent Toronto explosion seems to confirm this view. The possibility of a localised explosion initiated in the monitoring instruments in the gas circuit stands in need of special attention. It is reassuring to find in almost every paragraph of this section of the report, evidence of close and effective co-operation between the B.E.A., British manufacturers and the Factory Inspectorate, in an effort to reduce the danger to its minimum. This is an important factor in the satisfactory verdict on the industry as a whole which the Chief Inspector finds possible.

THIN LIGHT

Electroluminescense, from being a laboratory toy, is now emerging into the world as a practical light prospect. Both in this country and in America, research laboratories have been concentrating on the development of direct excitation of phosphors from electric fields, and according to a recent article in *Electrical Engineering* efficiences up to 4·24 lumens per watt at 500 V 60 c/s have been obtained. While this is low compared with 52 lumens per watt of the modern fluorescent lamp, it does not rule out the practical use of electroluminescence in certain specialised fields. The fact that the new lamp is in effect a two-dimensional entity, since its thickness is only one-quarter of an inch, and emits light of uniform intensity over an extended area, immediately places it in a unique category. Practical use is already being made for the illumination of meter and clock faces, for signs, and for photographic dark-rooms. For advertising, the range of colours available and the long life, combined with the thinness of the lamp and the ease of producing it in various shapes make it an ideal medium. At present the exact mechanism whereby energy is transferred from the alternating field to the phosphors has yet to be established, but enough is known to provide a basis for further development work and improvement.

Taaibos nears Commissioning

LARGEST SETS AND BOILERS YET INSTALLED IN SOUTH AFRICA READY AT PITHEAD POWER STATION

THE sharp increase in the demand for electricity for gold-mining and industries in the Transvaal and Orange Free State has imposed a heavy burden on the Rand Undertaking System of the Electricity Supply Commission of the Union of South Africa. This has necessitated the extension of existing power stations, where possible, and the erection of at least three new stations. One of these new projects is the Taaibos Power Station which is being erected in the Coalbrook district of the Orange Free State, where Escom has purchased a site of approximately 1,012 acres. The site is about 23 miles from Vereeniging (Transvaal) which is the nearest important centre.

The station has been designed broadly on the unit system, but to obtain greater flexibility of operation of units of 60 MW and boilers of corresponding size (the largest yet installed in South Africa) on a system with a load factor of 80%, the steam mains and feed suction and delivery mains are interconnected, so that either the unit system or the interconnected system may be used. Reasons of economy in the provision of standby feed pumps and various other items played a part in this decision. There are no steam receivers, steam to the turbines being taken through separators.

Work on site levelling, temporary water and electricity supplies for construction, together with a railway siding was commenced in May 1951 and construction is now well advanced.

Turbine Plant

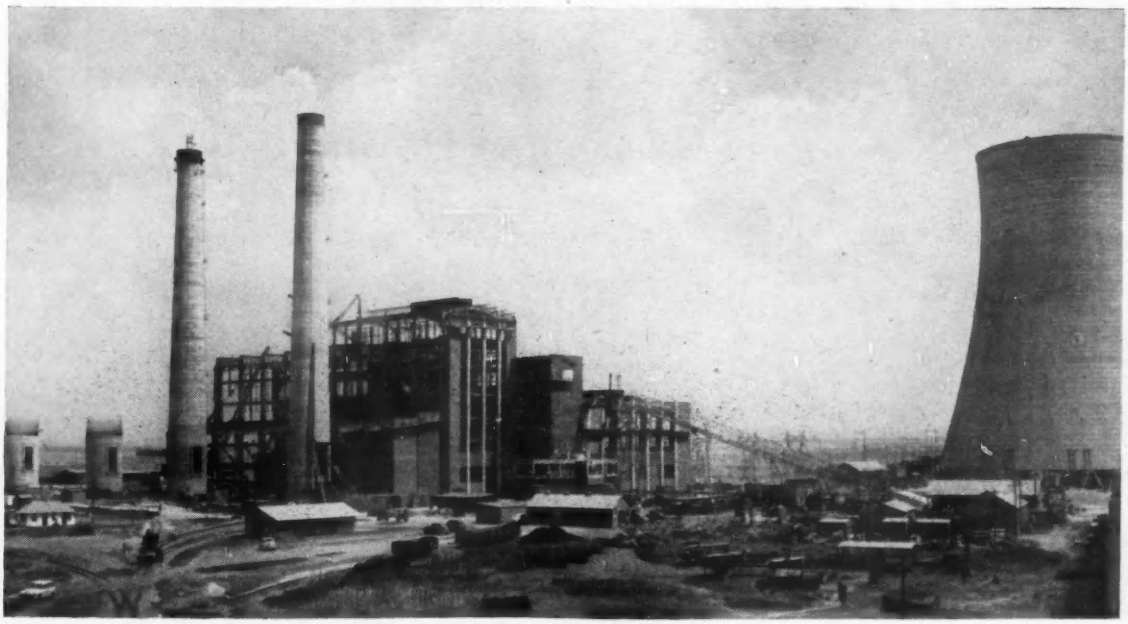
The installed capacity of the Taaibos Power Station will be 420 MW consisting of seven 60 MW turbo-generator sets. The first machine and boiler are expected to be in commission by November, 1954, and the remaining units at six-monthly intervals thereafter. The sets are designed for a continuous maximum and most economic rating of 60 MW at 3,000 r.p.m. They are of the three-cylinder reaction type, with double flow in the low-pressure cylinder. Steam conditions at the stop valve are 600 lb/sq in. at a temperature of 825° F (440·5° C) with an average circulating-water temperature of 75·2° F (24° C). The quantity of water circulating through the condensers will be 48,000 gallons per minute; steam consumption under the above conditions will be approximately 9 lb per kWh.

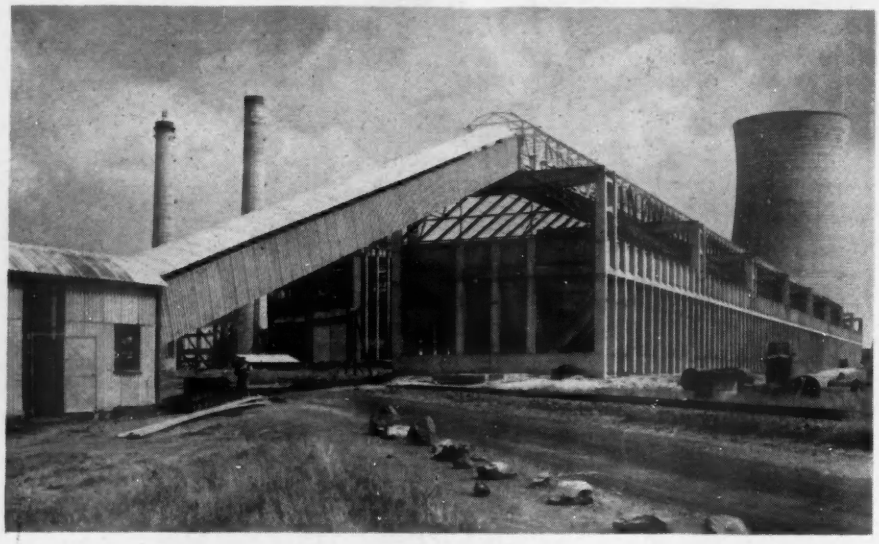
Each turbine is equipped with two unit evaporators of 12,000 lb/hour, each being fed with bled steam at 17·2 lb/sq in. absolute and 220° F (104·5° C).

Loads of the magnitude of that of the generator stators—108 tons—have not previously been carried over the 3 ft 6 in. gauge track of the South African Railways, and a special truck of light alloy was designed by the Railway Administration to transport the stators approximately 700 miles from the coast to the power station.

The following ancillary equipment will be installed in the turbine house: Three diesel-engine-driven fire pumps each with a capacity of 1,000 gallons per minute at 100 lb/sq in. discharge pressure.

Chimneys for the first section of the station are almost complete in this general view of Taaibos, taken at the end of March this year. The substation controlling the outgoing transmission lines is just visible beyond the main station buildings, while to the right is one of the cooling towers, of which seven will be built eventually





The conveyor from the Clydesdale colliery travels 5,600 ft in three sections, terminating in the 24,000 short tons capacity coal staith seen here

Automatic fire-extinguishing equipment on the turbine oil-purification plant and on the main and the auxiliary transformers to work in conjunction with the above fire pumps, two of which will always be on automatic starting and the third on manual control, for fire hydrant service around the station and the residential township.

There will be one water-purification plant with a capacity of 350,000 gallons per day. Three "river-water" pumps with a capacity of 450 gallons per minute each at 85 lb/sq in. will supply this water purification plant and the turbine evaporators.

Three drinking water pumps with a capacity of 400 gallons per minute each at 100 lb/sq in., will supply the station, township and adjacent colliery from which the coal for the station is obtained.

Water for use in the power station will be pumped from the Vaal River at a rate of 6,600 gallons/minute over a distance of 14 miles, through pipes having diameters of 24 and 27 in. The pumping plant will be remotely controlled from the power station. For cooling purposes, concrete hyperbolic natural draught towers, one per machine, each with a capacity of 3 million gallons per hour are being provided. The towers will be 270 ft high with a pond diameter of 200 ft. In addition there will be four storage reservoirs for make-up water, each with a capacity of 3 million gallons.

Boiler Plant

Seven pulverised fuel fired boilers, each with a capacity of 580 klb/hr will generate steam at a pressure of 630 lb/sq in. and a temperature of 850° F at the boiler output. The boilers are of the radiant bi-drum design with pendant superheaters and tangent tube furnaces. Final steam temperature will be controlled by means of two spray type attemporators on each boiler. Continuous-loop economisers will be installed. The total pressure heating surface of the boiler is 77,100 sq ft.

The airheaters will be of the tubular type. For each boiler four pulverised coal mills will be installed together with sixteen circular burners positioned in the front wall. Dust collectors are of the cellular type, and provision has been made to install electrostatic precipitators should this be found necessary. At present, owing to the remote location of the station, it is unlikely that this will be the case; but the furnace gases from each pair of boilers will be discharged into a common reinforced concrete chimney which will have a height of 300 ft, to ensure that the lighter dust is carried well away from the property.

The ash plant (hydrant system) will handle 1,400 tons of ash a day when seven boilers are in operation. The ash from the furnace will be collected in a water-filled hopper under the furnace mouth. Each hopper has been designed to provide storage capacity for 24 hours' make of ash with the boiler working continuously at 580 klb/hr evaporation. The mixture of ash and water will then be pumped from a transfer sump to a suitable settling ground, the farthest point of which will be situated over a mile away from the power station.

The boilers will be controlled by means of full automatic equipment. Each boiler will be more than twice the size of any unit yet built in South Africa, and the upper boiler drum will be located 110 ft above basement level. Eight motor-driven feed pumps each 700,000 lb/hr capacity, and two steam-driven feed pumps each of 350,000 lb/hr will be provided.

Fuel Supply

Taaibos will be a "pithead" power station in that it is being built on a coalfield so that the coal will go directly from the pithead to the coal staith and thence into the bunkers of the station. The coal will be conveyed to the staith by three conveyor belts in series, 5,600 ft in total length to the centre of the staith. The belts will travel at 400 ft/min and carry 650 tons/hr. This conveyor system, incidentally, will be the longest surface coal conveyor yet used in South Africa.

The coal staith has a capacity of 24,000 short tons, that is approximately 3½ days' supply, which is considered sufficient for a station adjacent to a coal mine. Coal will be fed to the staith by means of an overhead conveyor and travelling tripper and reclaimed through cut-off gates into two conveyors in an underground tunnel. The staith is designed to be self-emptying.

The coal itself, of which there is an estimated quantity of over 100 million tons available, is of a comparatively low grade, having an unexpected calorific value of only about 9,400 B.Th.U./lb air dried.

Electrical Plant

Each generator is rated at 60 MW at 0·85 power factor lagging at 11 kV and will be equipped with gear-driven main and pilot exciters. The ventilation of each generator is effected by means of two 386 horsepower cooling fans.

The generators will be directly connected to transformers stepping up from 11 to 132 kV in three-phase, 70 MVA oil-filled units equipped with air-blast cooling. These transformers weigh 116 tons each and will be the largest three-phase units yet used in South Africa.

For the interconnection with Escom's Vaal Power Station, two groups of single-phase transformers will be installed, each group having a capacity of 60 MVA and a ratio of 132/88 kV. Air-blast cooling will be used and tertiary windings on the transformers will supply the 3·3 kV station auxiliary services. For supply to the unit auxiliaries of the turbo-generator and its boiler, each generator will also be connected to a 7,500 kVA, 11/3·3 kV, three-phase oil-filled transformer with natural cooling.

The 132 kV circuit-breakers will be of the bulk-oil, auto-reclosing pneumatically-operated type with a rupturing capacity of 3,500 MVA and a current rating of 600 amps. For the outgoing 88 kV lines, 1,500 MVA, 400 amp bulk-oil auto-reclosing solenoid-operated circuit-breakers will be installed.

The station auxiliaries will be driven by 3·3 kV motors varying in size from 200 to 1,620 horsepower; smaller motors will operate off a 380 V three-phase supply.

The 3·3 kV switchgear will comprise 150 MVA draw-out type circuit-breakers with current ratings ranging from 200 to 2,000 amps, while the 380 V supplies will be controlled by fuse-switches with contactor starters.

An internal telephone system of the automatic type will be installed provided with code-calling facilities, and communications with the rest of the system will be effected by pilot wires or power-line carrier.

Buildings

The boiler and turbine houses are of the steel frame brick-clad type of construction, the roofs being covered with protected metal sheeting. It is of interest to note that some 13,000 tons of structural steel, most of which will be produced in South Africa, will be required for these two buildings and that each of the group of columns supporting each boiler will carry 1,290 tons with an overturning moment at the base of 850 ft-tons due to wind load.

The stores and workshops building will be a reinforced concrete frame with shell saw-tooth roof and brick cladding.

Residential Quarters

Owing to the distance from other centres, Taaibos will form a self-contained community having its own residential quarters and amenities, its own storm-water system, fire-fighting system, first-aid facilities, water-borne sewage, water and electricity services. The Commission has built houses, fully detached in view of their occupation in most cases by shift workers, each having an average area of 1,200 sq ft for married employees, and single quarters. In addition, a boarding house with caretaker's quarters, a club-house, guest house and swimming-pool, sports field, tennis courts, bowling green and rifle range will be provided.

The residential site will be situated about ½ mile from the power station and will be laid out on modern lines with parks and tree-lined avenues. The power station will eventually employ a staff of approximately 130 whites and 300 non-whites.

Children of white employees resident on the site are transported to and from school daily, there being no educational facilities at present in the immediate district.

Non-white employees will be housed in a compound of modern design with kitchen, messroom, recreation hall, washrooms, sick bay and Church. In certain cases married non-white permanent employees will be provided with separate houses containing bedrooms, living room and kitchen.

We are indebted to the Electricity Supply Commission of South Africa for supplying the information on which this article is based, and for granting permission for its publication.

Fire Research in 1952

DURING 1952 (the last year for which complete statistics are available) a total of 91,768 fires were attended by the N.F.S. or Fire Brigade, some 19,300 more than in 1951. Of the total, approximately half (46,696) were in buildings—a little over 4,000 more than the previous year. Electricity was associated with 8,016 of the latter. These figures are taken from the Report of the Director of Fire Research for last year, which also states that the total number of fires attended during 1953 amounted to approximately 87,000.

As can be seen from the table below, fires caused by electric wire and cable continued to form the largest proportion of fires with which electricity was associated. Electric fires, heaters and radiators, and refrigerators also contribute a high proportion. How many of these are due primarily to the user's carelessness, and not to a defect in the equipment, is impossible to estimate.

The study of the occurrence of fires in dwellings since 1946, with its detailed comparison of the behaviour of non-traditional post-war houses with that of pre-war houses was continued in 1952. Non-traditional is applied to houses, either permanent or temporary, built of materials or by methods not generally used in this country before 1939. The rates of incidence of fires, both in pre-war and in post-war temporary houses, have shown signs of increasing between 1946 and 1952, although that of serious damage has remained appreciably constant. Among temporary houses, the chief causes of fire in the two types with the highest rate of incidence were "electric wire and cable".

Undertaken several years ago at the request of the Ministry of Education, the analysis of fires in schools was continued last year. As in the case of domestic dwellings, about one in every six fires was attributed to causes associated with electricity.

Introducing the report of the Fire Research Board, the Chairman comments that the programme for the coming year had been heavily pruned, energy having thus to be concentrated on some of the more pressing items. Even so, the effort will still be meagre in some directions, and in all sections of the laboratory the pressure to obtain information for particular purposes can only be at the expense of the basic research for which there is a real need.

Causes of Fire in Buildings

Supposed cause of fire	1948	1949	1950	1951	1952
Electric cooker ...	444	744	740	784	804
Fire, heater, etc. ...	893	900	1,092	1,180	1,148
Iron	356	436	372	364	372
Motor	280	180	264	310	324
Refrigerator... ...	789	1,108	1,132	1,020	1,124
Wire and cable ...	2,353	2,680	2,250	2,694	2,728
Wireless, television	365	444	450	548	584
Other apparatus ...	540	736	906	948	924
Static electricity ...	19	24	22	32	8
Total associated with electricity	6,039	7,252	7,228	7,880	8,016
Miscellaneous and unknown	4,755	5,600	5,798	5,830	6,824
Total fires in buildings	37,246	42,792	43,744	42,394	46,696

Safety in Supply

Factory Inspector's Report Discusses Generation and Distribution

SPECIAL attention to the electricity supply industry is a feature of the Annual Report of the Chief Inspector of Factories for 1952, published last week by H.M.S.O. The introduction to the report includes a discussion on electricity supply generally, and special attention is given to the hydrogen cooling of alternators.

It is noted that equipment in generating stations is well up to the standards of safety required by the Regulations. The ring or mesh type of layout for switchgear is considered to have advantages over the more usual duplicate busbar arrangement, especially as it obviates the need for bus-zone protection. During the year, however, failures occurred in post-war e.h.t. metal-clad compound-filled busbars due to the use of unsuitable oil, defective separators and careless compound filling.

Some concern is felt about the larger boiler control panels installed in new stations. Many of these have internal passage ways, giving access to the instruments for maintenance, and often these are rather narrow, and lined with many terminals and conductors alive at voltages up to 400. It is understood that steps are being taken to shroud all conductors in appropriate groups by removable insulating shields. There is preference, however, for boiler panels so shallow in depth that all gear can be reached from the back or front.

An improvement is mentioned in the protection of auxiliary motors and feeders—it must be borne in mind that the report relates to 1952. Relays designed specifically for the protection of motors having high starting currents are being used, and they are provided with instantaneous elements for short-circuit protection.

Initially, the possible hazards arising from the use of hydrogen-cooling for alternators were not fully realised, but increased attention has now been given to this subject. It is stressed, however, that from experience, it is not held that the risk of explosion under normal conditions is serious. Nevertheless, already the existence of an inflammable concentration in a machine in service in this country has been recorded: the hydrogen was diluted below the higher inflamability limit (74% hydrogen with air) due to failure of the bellows seal on the shaft. This emphasises the need to ensure that no source of ignition within the hydrogen system should be introduced in the form of unsafe control or recording apparatus and several recommendations are made in this respect.

Electrical Accidents

Fatal electrical accidents reportable under the Factories Act totalled 38 in 1952, and non-fatal 683 plus 158 eye-flash accidents in connection with welding, giving an overall total of 721. This was six more than in 1951. Details in relation to apparatus are shown in the table.

Once again the use of portable electrical apparatus at mains voltage has been responsible for a high proportion of accidents. Rough usage is usually to blame, and the Report gives a reminder here that an obligation to provide safe working conditions lies with the occupier of a factory. The relevant passage is worth quoting: "It has been laid down in the Court of Appeal that employed persons must be safeguarded even against the consequences of their own folly, and it is, therefore, enjoined on owners by case law, as it is implicit in the Factories Act, that the best-known safeguards appropriate to the conditions must be taken. Administration of the Factories Act is bound by such law."

The emphasis is on the use of 110 V supplies for portable tools, centre-point earthed. Since the safety of such a system depends to a considerable extent on the integrity of the transformer earth, it is desirable that the transformer should be fixed rather than portable. If the transformer is portable, its case should be insulated and the connecting cable kept as short as possible. It is essential that earth cores and associated connections should be tested by means of a substantial current to make sure that the earth connection is sound mechanically and electrically.

ELECTRICAL ACCIDENTS IN RELATION TO APPARATUS, 1952.

Apparatus	Fatal		Non-fatal		Total
	Men	Women	Men	Women	
Electrical machinery ...	—	—	7	2	9
Transformers	—	—	2	—	2
Switchgear above 650 V ...	8	—	29	—	37
Switchgear below 650 V ...	—	—	107	2	109
Fusegear	1	—	44	1	46
Crane trolleys	1	—	27	—	28
Electric welding:					
(*a*) Shock and/or burn...	—	—	25	—	25
(*b*) Eye injuries... ...	—	—	158		158
Portable electric machines	5	—	37	1	43
Portable heaters and irons	—	1	1	4	6
Portable lamps	4	—	13	—	17
Fixed lamps	—	—	12	—	12
Plugs and adaptors ...	1	—	24	9	34
Cables and flexibles:					
(*a*) Portable apparatus...	3	—	39	—	42
(*b*) Fixed installations ...	8	—	62	—	70
Testing	2	—	44	2	48
Other apparatus	4	—	25	6	35
Totals excluding eye flash	37	1	656	27	721

It is stated in the Report that an increased number of fires and explosions arising from electrical causes occurred during the year, but details are given for a few cases only. In cases quoted, the fires were due to the use of electric equipment to handle inflammable materials. For instance, three fires were caused by suspended control cables of ground-operated cranes receiving damage from the sharp edges of plate loads carried after paint dipping. The resulting arc ignited the dripping inflammable mixture.

Finally, some notes on lighting. 1952 was a particularly noticeable year in this respect, partly because of the willingness of managements to spend time and money on the careful planning, and installation of comprehensive artificial lighting schemes for whole factories or departments. It is considered that electric lamp manufacturers have stimulated considerable interest in the subject of artificial lighting by their publicity campaigns, and they have given much advice to industry based on their wide theoretical knowledge and practical experience.

One feature of the year was a falling away in the rush to install fluorescent lighting in any and every situation. Local lighting on machines received more attention, though there is room for much improvement there.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

E.P.E.A. Gives Notice

YOUR editorial last week on "E.P.E.A. Gives Notice" was very interesting as giving a new approach to the problem of electricity supply engineers' status. It is worthy of consideration. It is undoubtedly true that some grades of technicians are really on a par with the higher level of non-technicians, and that some line must be crossed from technician to professional engineer, this would imply a two stage schedule.

However, the Boards and Divisions themselves do bear a responsibility, in that they have appointed to upper grade persons without any qualifications to justify professional status, in spite of advertisements desiring the highest level of technical achievement. The E.P.E.A. by its constitution in any case must accept as members anybody whom the Boards, etc., appoint to their technical staff.

To return to the claim, even when a grade of supply engineer is deemed only to be a technician, if he is giving instructions to a foreman he is entitled to a higher level of remuneration for that degree of responsibility. To consider another case, that of the District Engineer, a post comparable with the former Mains Superintendent, with in many cases a greater degree of responsibility and a more onerous task, the latter usually received a salary from 2½ to three times that of his general foreman, and this foreman usually carried a greater degree of responsibility than his counterpart to-day, for a weekly wage of between £5.-£6. It was nevertheless a much sought after position. What is the comparison to-day? The D.E. (professional engineer required) barely receives 50% more than his foreman, in spite of heavier taxation. The equitable salary for a District Engineer to-day is not less than £1,200 p.a.

Chartered Electrical Engineer,
LONDON, W.9.

* * *

YOUR comments in your last issue on the claim of the Electrical Power Engineers' Association for a substantial improvement in the salaries and status of technical staff in the electricity supply industry are surely confused in talking about "the variety of standards amongst the E.P.E.A. members themselves." A rational and workable salary structure in a large undertaking can only be built by measuring the responsibilities attached to particular positions and not by trying to assess the qualities and characteristics of individuals who come and go. This was accepted many years ago in electricity supply as in other branches of public service. If, therefore, the E.P.E.A. claim—as we do—that power station superintendents or control room engineers, chief engineers or junior engineers, are underpaid in relation to these responsibilities, it is no answer to tell us that some men are better than others. They may or they may not be, but management appoints all of them on the assumption that they are capable of carrying out the duties which go with their jobs. If that be not the case management has an obvious remedy, which it is never slow to apply.

The essence of the present E.P.E.A. claim is that the breadth of the responsibilities and the importance of the duties of technical staff at *all* levels have come to be increasingly under-valued by the Electricity Boards. We wish to maintain or even to extend differentials between grades—we think it most important—but that is very different from giving Mr Y and Mr Z unequal pay for equal work, which would be the outcome of the logic of your paragraph.

Your remark about lack of qualifications of E.P.E.A. members, if true, would be a serious slur on the technical staff of British electricity supply, for the overwhelming majority of them are in the E.P.E.A. In fact, of course, the competence and ability of that technical staff is proved by the many achievements of the industry for which the ELECTRICAL TIMES rightly provides such excellent and deserved publicity from time to time.

Finally, Mr. Editor, you have been dozing and your newshounds kennelled when they should have been out on the prowl. The E.P.E.A. now has its own Managerial Sections, to which engineers in the "higher positions" are attached; the internal adjustment you advise has been made already.

A. M. F. Palmer, A.M.I.E.E., E.P.E.A., M.P.,
LONDON, S.W.1.

Static Electricity

YOUR correspondents Messrs. Swann and Magee have raised some interesting points. Mr. Magee has shewn that an insulated body having an orifice from which gas issues at high velocity would be expected to acquire a negative charge, and poses the question as to what would happen if it approached a gas pocket of positive potential.

The further question now arises whether the existence of a gas pocket of positive potential could be anticipated in the upper atmosphere.

Readers of Dr. B. J. F. Schonland's interesting book "The Flight of Thunderbolts" will find it demonstrated that thunderclouds (and perhaps other clouds) usually have a negative charge at the base and an equal positive charge at the top. The top is often at a very high altitude. It is not certain whether the signs of the top and bottom charges can ever appear in the reverse sense, but present theories and experiment tend against this possibility.

Supposing that a jet aircraft having a heavy negative charge upon it approached a positively charged cloud, it is to be assumed that a discharge of electricity would take place, that is, the aircraft would be "struck by lightning." Many cases are on record of aircraft having been struck by lightning and not having suffered serious structural damage, though the instruments have been seriously affected. I do not know if any of these aircraft have been jets, but in any event it would appear that the lightning discharge in question has usually included the body of the aircraft in its path because it thereby found a route of lower impedance than the surrounding air for a discharge between two oppositely electrified parts of a cloud or between a cloud and earth. A heavy current through the structure has probably been involved, and the damage this might do would be affected by the adequacy or otherwise of electrical bonding between the separate components.

In the cases of lightning strikes on record it is probable that the aircraft structure has not already acquired a charge, or not a heavy one. (A charge could result by electrostatic induction from a nearby cloud.) Whether the discharge could be disastrous in the contrary event seems questionable.

A further speculation is whether the atmosphere (especially the higher parts of it) can acquire an electrostatic charge when visible water vapour ("clouds") are absent.

F. J. Halligey,
DURBAN, S. AFRICA.

Electricity helps the Civil Engineer

INTERESTING DEMONSTRATIONS AT INSTITUTION'S ANNUAL CONVERSAZIONE

SEVERAL items at the Conversazione of the Institution of Civil Engineers, held last Thursday, were of electrical interest. There were, of course, the usual selection of most excellent models of large civil engineering schemes, among which was one showing the development of London Airport, one of the new generating stations, powered with five English Electric 1,100 h.p. diesels now under construction at the Point of Ayr Colliery of the N.W. Division of the National Coal Board, and one giving an artist's impression of the 70 MW Dekhelia power station in Cyprus.

Detection Equipment

Electricity as a detecting and locating agent was shown in several instances. There were two examples of portable rail flaw detectors, the "Sonirail" and the "Audigage." The first of these consists of an electronic transmitter and receiver, fed by special batteries, and a piezo-electric probe carried on the end of a telescopic stick. The crystal probe applied to and passed along the railhead transmits varying ultrasonic vibrations in the form of a narrow vertical beam. These are normally reflected back by the rail flange, and, mixed with the output frequency—which has, of course, changed during the time taken for transmission and reflection in the rail—produce a beat signal of audio-frequency. The pitch of this is a characteristic of the rail, and any flaw causes a distinct change in pitch. The instrument was supplied by Matisa Equipment Ltd.

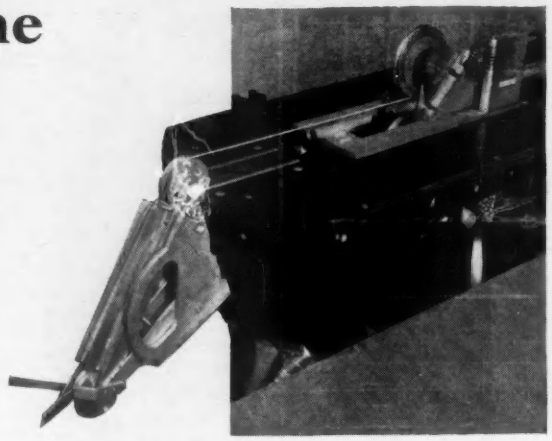
The Audigage also uses a supersonic method, but has oil to ensure good inter-surface contact, instead of water and detergent as used in the Sonirail.

To locate reinforcement in concrete is the "Covermeter" by Kolectric Ltd. This operates from a 6 V accumulator or from a.c. mains, and can measure the depth of cover over the reinforcement from 0 to 2 ins.

Cable Laying

By the use of submerged repeaters it is possible to utilise long distance submarine cables for telephonic purposes. Two forms of repeater have been developed, one of which is flexible and can consequently be handled by normal cable-laying machinery, in the other type the repeater is contained within a heavy steel casing 11 ft long, 1 ft in diameter and weighing 10 cwt. While the former type is convenient, it is nevertheless more vulnerable to damage than the latter. Laying the steel-cased repeater is, however, difficult as the repeaters cannot pass over the paying out drum, and this means that every 50 miles, the cable must be secured, turns taken off the drum, the repeater paid out, and turns put on the drum again before normal cable laying can continue.

To obviate this, Johnson and Phillips in conjunction with Messrs A. C. Hartley and R. J. Ashby now have developed a system whereby the cable is handled by two sheave pairs. These pairs of sheaves are mounted on the deck, and each unit is so arranged that the sheaves can be moved relatively to each other. When a repeater arrives at the forward unit,



Stern of cable ship model to show aft sheaves and paying out system. Repeater is in the downcoming chute

the sheaves move so as to clear the cable allowing the repeater to pass straight through, the tension being taken meantime by the aft unit. After the repeater is through the forward unit, the sheaves again take up the tension, and the aft unit operates. A special stern gear also operates to lift the cable off the final paying-out sheave and allow the repeater to pass freely into the ocean.

Power Station Plant

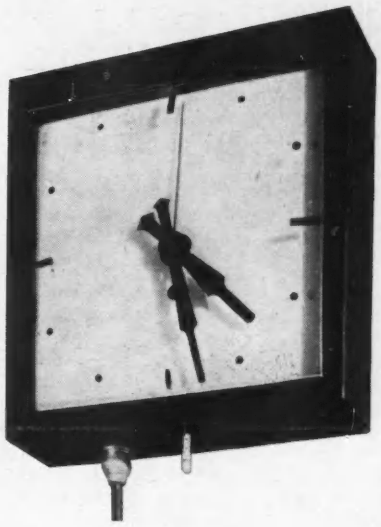
Comparatively little was shown of direct power station equipment, but a particularly interesting model illustrated the construction of the Mitchell boilers being installed at Portishead "B" power station. Each of the eight boiler units now being supplied by the company is designed for an output of 300 klb/hr at 950 lb/sq in. and 925°F.

Another interesting model, by the Hydraulic Research Station, showed how a simple solution had been found to the problem of suppressing waves at Dekhelia. The cooling water at this station enters the sea by a concrete flume 8 ft wide and 7 ft deep. It was found that under certain wind conditions waves, some 3 ft high, travelled upstream to the head of the flume where they broke, splashing the steelwork of the station, which is a semi-outdoor structure, and causing accelerated corrosion.

The solution lay in introducing a submerged weir of sufficient height to result downstream in the formation of a stationary breaking wave (the hydraulic jump). As each external wave arrives, its energy tends to be lost in the turbulent section of the standing wave, the front of which temporarily moves upstream and then recedes. In this to-and-fro motion, if the wave front fails to reach the rounded portion of the weir, the train of travelling waves is completely intercepted; if not, the travelling waves pass over the weir and resume their march upstream, but with their height reduced to negligible proportions.

The British Hydromechanics Research Association, showed a Perspex model of a coal pumping plant, for lifting coal up the pit-shaft. Another interesting item was a non-linear electrical analyser for investigating the flow in pipe networks. Each pipe is simulated by an electrical analogue consisting of a group of small electric bulbs in parallel and in series. The resistance of the group bears a non-linear relationship of the form $V=kI^{1.85}$ analogous to the Hazen-Williams formula $H=k_1Q^{1.85}$ where H=loss of head in feet and Q=flow in cusecs. This last exhibit was by Mr T. M. Prus-Chacinski.

ELECTRO-LUMINESCENCE for Darkroom Lighting



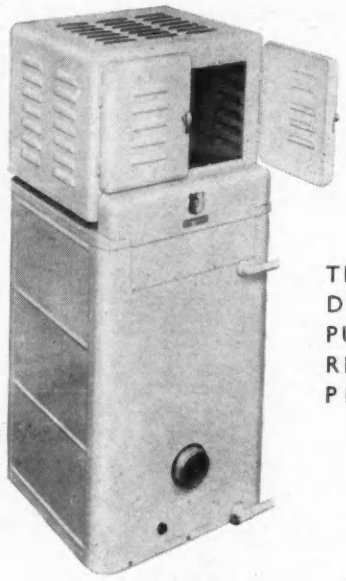
This dark-room clock incorporates a G.E.C. electro-luminescent panel. In front of the panel and hands is a "Perspex" screen carrying the figure marks which, like the hands, are seen in silhouette when the panel is illuminated

A RANGE of panels using the phenomenon of electro-luminescence has been introduced by the General Electric Co., Ltd. The colour of the light produced by these panels is dependent on the luminescent materials used, which are directly excited by an alternating electric field. The illustration shows an electro-luminescent clock installed in the coating-plant of a large photographic manufacturer. It is not of course desirable when working with panchromatic emulsions to provide a general level of illumination high enough to enable individual objects in the dark-room to be recognised, but the light given by the panels—which form a part of the general installation—is sufficient to allow them to be used as landmarks in guiding operators in their movements, within the dark-room.

Four standard sizes of panel, up to 8 in. square, are being produced, emitting light of a colour known as "Panchromatic Green." This colour corresponds to a region of low sensitivity for panchromatic emulsions, and at a given brightness level there is no risk of films becoming fogged.

Panel brightness varies with frequency and voltage of supply and a simple potentiometer circuit may therefore be used to control the brightness level. The panels at present available are designed for operation at 200-260 V a.c. only at 50 c/s. Power consumption is negligible being in the order of one or two watts. The low power dissipation and consequent cool running of the electro-luminescent panel gives it a particular advantage over the conventional tungsten lamp for darkroom work as the problems of ventilation, and the rapid deterioration of filters due to their becoming over-heated, do not arise.

Heat *and* Cold from One Appliance



THE DUO-THERM DOMESTIC HEAT PUMP PROVIDES REFRIGERATION PLUS WATER HEATING

ONE of the exhibits in the exhibition at the B.E.P. Convention at Eastbourne, which created a considerable amount of attention was the "Duo-Therm" packaged domestic heat pump. This unit is capable of providing at the same time both domestic hot water, heated by pumping heat from the refrigeration side of the unit and refrigeration facilities. Installed in a larder, it will take heat out of the surrounding air and transfer it to the water in a 30 gall. insulated tank. It is claimed that in an average size pantry, it will reduce the ambient temperature to about 40° F. and apply the extracted heat to raise the temperature in the 30 gallons of water in the tank to about 140° F. An ice-box is incorporated on the "cold" side of the unit and is equipped for the storage of bottles of milk and so on. An immersion heater can be fitted in the tank as an optional extra, to cope with situations when sudden demands are made for large quantities of hot water.

Installation of the unit, which is 56 in. high by 24 in. wide by 24 in. deep is a fairly simple matter. Two water connections are involved, one from the domestic cistern, and an expansion pipe from which hot water is taken to the taps. Electrically, it is only necessary to connect the mains to two terminals, line and neutral, and connect up an earth terminal. These three terminals are housed in a suitable box in the base of the unit.

As the heat function is essentially a transference of heat, the power consumption of the unit, without an immersion heater, is comparatively small, being in the region of 300 W. This is low enough to enable it to be used off restricted supply as is frequently found in rural areas.

The unit is produced by Brentford Electric Ltd, at Kidbrooke Park Rd, Kidbrooke, London, S.E.3. It is understood that at the moment, the question of purchase tax is under consideration, and in consequence it is difficult to give a firm price. Queries should therefore be directed to the firm.

Solving Networks by Thévenin's Theorem

ADVANTAGES OF THE CONSTANT CURRENT LOAD CONCEPT

By S. W. SWANN, B.Sc. (Eng.), A.M.I.E.E.

THE hundred-year-old theorem[1] variously associated with the names of Helmholtz, Thévenin and Pollard may be enunciated in the following form which is applicable to either a d.c. or an a.c. circuit:

Any linear network of bilateral elements viewed from any two terminals of the network can be replaced by a generator of constant e.m.f. E and impedance Z: E is the open-circuit voltage measured across the selected terminals; and Z is the impedance of the network between these terminals, all generators being de-excited and all constant-current apparatus being open-circuited.

In amplification of this statement it may be said that a linear network is one in which every constituent part, i.e. element, has a constant impedance, that is to say the current through it is proportional to the voltage across it and hence a graph of current plotted against voltage will be a straight line. A bilateral element is one offering the same impedance for either direction of current flow through it. When a generator is de-excited (but running at synchronous speed) its effect on the network is represented by its synchronous impedance, the effects of magnetic saturation and of saliency being ignored. The term "constant-current apparatus" includes any device which carries a current that is not influenced by changes in the impedance connected across its terminals, e.g. a metadyne in a d.c. circuit, a current transformer in an a.c. circuit.

An elementary proof of the above theorem based upon the principle of superposition is included in most text books on the principles of electric circuits[2], and this aspect will not be further considered here. A familiar if unconscious application of the theorem relates to the operation of a generator, respecting which it indicates that the current is equal to the open-circuit voltage divided by the sum of the external and internal impedances.

Constant Current Devices

In the determination of Z it is clear that, as in a simple d.c. network, any source of e.m.f. must be suppressed but its internal impedance retained, a condition that is realised by removing the excitation. It is also evident that any constant-current device must be taken out of circuit because such a device does not offer a path for any supplementary current that would flow in the network as the result of connecting together the two selected terminals: the corresponding branch of the network must therefore be open-circuited for the purpose of determining the value of Z.

At this point it is convenient to consider two simple examples:

(*a*) A network incorporating a source of e.m.f. but no constant-current device.

Such a network is shown in Fig. 1 in which E denotes the constant e.m.f. of a generator (or battery) whose internal impedance (or resistance) is represented by z. It is required to determine the current I_1 that would flow through an impedance Z_1 connected between terminals a and b.

In accordance with Thévenin's theorem it is first necessary to determine the voltage across ab: call this V_T. Then

$$V_T = \frac{E}{z + Z} Z.$$

Secondly, the impedance Z_T say, across ab is given by

$$Z_T = \frac{zZ}{z + Z}$$

The equivalent circuit is as shown in Fig. 2 and we have

$$I_1 = \frac{V_T}{Z_T + Z_1} = \frac{EZ}{zZ + Z_1(z + Z)},$$

on substituting the values of V_T and Z_T and simplifying.

It is easy to verify this result, independently of Thévenin's theorem.

(*b*) A network incorporating a constant-current device.

A simple example is shown in Fig. 3, which represents a current transformer supplying an impedance Z, the effects of the resistance and leakage reactance of the transformer being represented by z. It is required to determine the current I_1 that would flow through an impedance Z_1 connected across terminals a b.

The current supplied by a current transformer is nearly independent of the impedance connected across its secondary terminals, provided that this is within the range of normal values, and is governed almost entirely by the current in the primary circuit and by the ratio of the transformer. Hence we are justified in regarding a current transformer as a "constant-current" device.

In accordance with the conditions of Thévenin's theorem we have for the p.d. and the impedance across a b

$$V_T = IZ,$$
$$Z_T = Z.$$

$$\text{Hence } I_1 = \frac{V_T}{Z_T + Z_1} = \frac{IZ}{Z + Z_1},$$

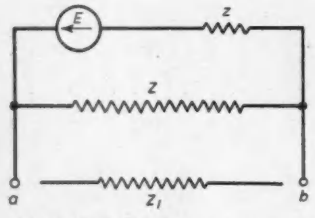


Fig. 1. Network incorporating a source of e.m.f. but no constant current device

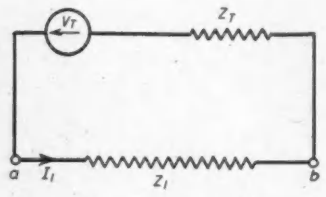


Fig. 2. Equivalent circuit of Fig. 1 as derived by Thévenin's theorem

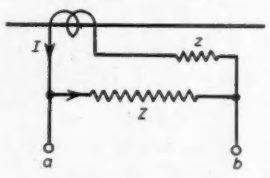


Fig. 3. Network incorporating a constant current source, here shown as a current transformer supplying a fixed impedance Z

a result which is otherwise immediately evident on the supposition that the transformer secondary current is unaffected by the introduction of the additional impedance Z_1.

Typical Problems

In the application of this theorem to an electrical network the procedure of calculation is dependent to some extent upon the manner of specification of the loads supplied by the network. In the case of a light-current network the impedance values of all the elements will generally be known and the determination of what has been termed Z_T is effected by a process of network simplification and as a rule presents no difficulty. In the case of a power supply network, however, it is usually the kVA or the current and also the power factor of each of the loads supplied that are known. Broadly speaking, two types of problem arise, viz, the determination of the current carried by (1) a proposed interconnector or (2) an existing cable, and the procedure of calculation must be adapted to suit each condition.

In a problem of type (1) the current distribution in the existing network must be determined to enable the p.d. (V_T) across the proposed points of interconnection to be calculated. The impedance Z_T between these points before interconnection is governed by the impedance distribution of the supply network and also by the impedances of the individual loads. The cable impedances are easily ascertained and those

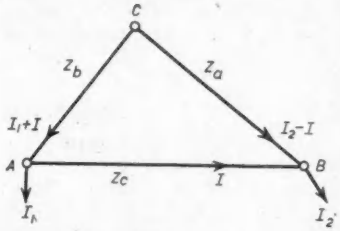


Fig. 4. Simple network discussed in connection with the concept of equivalent constant current load

of the load must be calculated from the known values of kVA (or current) and power factor, the p.d. at each load being determined either by measurement or by calculation. This procedure, which yields accurate results, may involve lengthy calculations and it will generally be preferable to resort to approximation. For this purpose it may be assumed that the load currents are unaffected by the proposed interconnection and hence the problem may be regarded as one of type (2) as above defined. The procedure of calculation in this case is much simpler and will now be discussed.

The current that flows in any particular cable of a distribution network is governed by the values of the current and power factor of each individual load, but is obviously independent of the *nature* of these loads. Hence *for purposes of calculation it is permissible to substitute for each load a constant-current device* taking the same current at the same power factor as the actual load. This process in no way upsets the essential conditions of the problem and thus introduces no error. In order to apply Thévenin's theorem we now imagine the cable whose current loading is to be determined to be open-circuited. The load currents will, on

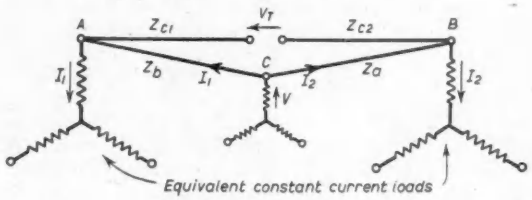


Fig. 5. Equivalent circuit derived from that of Fig. 4 by substitution of constant current loads

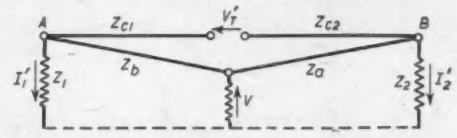


Fig. 6. Modified conditions applying in Fig. 5 after opening the interconnector and substituting constant current loads

the above basis, remain unchanged and consequently the current distribution in the network can be ascertained and the p.d. (V_T) across the open ends of the cable calculated therefrom. Further, the branches representing the loads, which are connected between phases or between phase and neutral, or between the positive and negative sides of a d.c. system, must be open-circuited for the purpose of calculating Z_T, the impedance across the open ends, in accordance with the condition governing the application of Thévenin's theorem to constant-current loads. This calculation is thereby greatly simplified since the individual phases or sides of the supply network are isolated from each other by the interruption of the load branches. This will be rendered clear from a consideration of the example that is given below.

Constant Current Load

Problems of this type are commonly discussed in textbooks with the aid of Thévenin's theorem but no mention is made of the great value of the equivalent "constant-current load" concept in simplifying calculations, although such simplifications are taken for granted when calculations are made. The actual conditions when any particular cable is open-circuited are of course different from those conforming to the procedure stated above, since the cable currents and voltage drops will be modified, and the p.d. at each load and consequently the load itself will alter to some extent. This discrepancy is likely to lead to a suspicion that the calculated result is only approximately correct, especially when it is considered that the load impedances themselves are left out of account. This reasonable suspicion will probably become replaced by bewilderment if in a simple case the "approximate" result deduced by Thévenin's theorem is checked against the necessarily correct value calculated by means of Kirchoff's laws and is found to be in agreement therewith!

If the calculation is made without previously replacing the actual loads by equivalent constant-current loads allowance must be made for the variation of load currents when the cable under consideration is opened and also for the impedances of the loads as previously discussed. This will lead to modified values V'_T, Z'_T whose ratio, however, must be the same as the ratio V_T/Z_T, by Thévenin's theorem. Either method of procedure is permissible but the concept of the equivalent constant-current load leads to a greatly simplified solution.

For the purpose of illustrating the preceding discussion we may now consider the simple example shown in Fig. 4.

Two balanced three-phase loads located at A and B are supplied from a substation at C through feeders having impedances per phase equal to Z_b, Z_a respectively. There is also an interconnector of impedance per phase Zc, as shown. It is required to determine the value of the current I flowing through this interconnector.

On substituting two equivalent constant-current loads at A and B and opening the interconnector we obtain a condition shown diagrammatically in Fig. 5. The supply system is represented by a generator of zero impedance giving a constant e.m.f. V from neutral to line at C. This is an approximately correct representation in the case of an extensive interconnected supply network but if desired the equivalent generator can be given a suitable impedance, although this

would naturally complicate calculation. The loads at A and B are assumed to be either star-connected or replaced by equivalent star-connected loads.

The value of the p.d. V_T is clearly

$$V_T = I_2 Z_a - I_1 Z_b$$

The impedance across the gap in the interconnector is

$$Z_T = Z_{c1} + Z_b + Z_a + Z_{c2} = Z_a + Z_b + Z_c,$$

remembering that the constant-current devices must be open-circuited when calculating Z_T. Hence by Thévenin's theorem

$$I = \frac{V_T}{Z_T} = \frac{I_2 Z_a - I_1 Z_b}{Z_a + Z_b + Z_c} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

This result may also be deduced directly by the aid of Kirchoff's second law since this gives

$$(I_1 + I) Z_b + IZ_c - (I_2 - I) Z_a = O,$$

which leads to the preceding expression (1).

It is evident that there is little to be gained by employing Thévenin's theorem in this case, which is a particularly simple example chosen for the sake of illustrating the procedure of calculation. In more complex cases a pronounced simplification may be gained by use of the above theorem.

In order to emphasise the great advantage due to the substitution of equivalent constant-current loads it will be instructive to reconsider the above simple example without making this substitution, that is on the basis of the actual variable-current loads. The modified conditions following the opening of the interconnector are now as indicated in Fig. 6, in which the neutral points of the loads are joined to the generator neutral by connections of zero impedance. All three phases are supposed to be opened simultaneously so that the circuits are always balanced and hence the resultant current in the neutral connections is always equal to nothing. The load impedances are represented by Z_1 and Z_2.

In this case

$$V'_T = I'_2 Z_a - I'_1 Z_b,$$

where $I'_1 = \frac{V}{Z_1 + Z_b}$ and $I'_2 = \frac{V}{Z_2 + Z_a}$

Also $Z'_T = Z_{c1} + \frac{Z_b Z_1}{Z_b + Z_1} + \frac{Z_a Z_2}{Z_a + Z_2} + Z_{c2}$,

remembering that the generator is assumed to have zero impedance.

Hence on closing all three phases of the interconnector the value of the current that would flow is

$$I = \frac{V'_T}{Z'_T} = V \frac{Z_a/(Z_2 + Z_a) - Z_b/(Z_1 + Z_b)}{Z_c + Z_b Z_1/(Z_b + Z_1) + Z_a Z_2/(Z_a + Z_2)}, \quad \ldots (2)$$

on making the necessary substitutions. This expression for I in terms of the load impedances and the voltage at the substation is exactly equivalent to the former expression (1) in terms of the load currents but is more complex both in form and in derivation and necessitates a knowledge of the load impedances.

If the cable impedances are negligibly small in comparison with the load impedances it is immediately evident that

$$V'_T \longrightarrow I_2 Z_a - I_1 Z_b = V_T$$

and $Z'_T \longrightarrow Z_c + Z_b + Z_a = Z_T$,

and therefore $V'_T / Z'_T = V_T / Z_T$

This equality, however, must hold true under all conditions as previously observed. To demonstrate that this is so it is necessary to substitute in (1) the values of I_1 and I_2 in terms of the corresponding impedances Z_1 and Z_2.

Thus $I_1 = \frac{V_1}{Z_1} = \frac{V - (I_1 + I) Z_b}{Z_1}$

and $I_2 = \frac{V_2}{Z_2} = \frac{V - (I_2 - I) Z_a}{Z_2}$

wherein I is to be replaced by expression (1).

Hence I_1 and I_2 may be expressed explicitly in terms of V and the load and cable impedances. On substituting these expressions for the load currents into equation (1) and simplifying it is possible to obtain equation (2) again, but the exercise is not recommended to those weak on algebra!

REFERENCES

1. First published in 1853 by Helmholtz and rediscovered thirty years later by Thévenin, this theorem is generally linked with the latter name. See G. W. O. Howe, "The Make and Break Network Theorem of Helmholtz," *Wireless Engineer*, Vol. 20, pages 319–22, 1943.

2. See, e.g. H. Tropper, *Electric Circuit Theory*, Longmans, 1949, page 20. A formal mathematical demonstration will be found in M. B. Reed, *Alternating Current Circuit Theory*, Harper and Bros., New York, 1948, page 358.

E.W.F.'s Fortieth Birthday

AT the Dorchester Hotel, London, last week, the Electrical Wholesalers Federation celebrated their 40th birthday with a luncheon to members of the Council, the Electrical Editors and Past Presidents. In that span of years the Federation has grown from the original eleven prospective members who met on 9th June, 1914, to an organisation 200 strong, with 600 branches and depots throughout the country. If the 9th June, 1914 was a happy day for wholesalers, the 9th June, 1954 was sad, for it saw the passing of the Federation's first President. How appropriate it would have been if Mr R. W. "Bobbie" Smith could have replied to the toast of the Past Presidents.

Main toast at the luncheon, the E.W.F., was proposed by Lord Citrine, chairman of the B.E.A., who assured his audience of the Authority's co-operation and remarked that they were eligible for membership of the Federation. Speaking of the B.E.P.C. he said that although all sections of the industry were represented in discussions at Council meetings, there was no introduction of sectional interests.

Lord Citrine went on to refer to the enquiries of the Monopolies Commission. He said he did not like compulsion, which in any case may be ineffective. He believed rather in free, frank and friendly relationships in industry, which he found existed at the present, and which he endeavoured to foster. Turning to the possibility of a slump, Lord Citrine said there was none more capable of withstanding the impact than the electrical industry. If a recession should come it might stimulate the industry. The industry could meet all problems so long as it kept together, he concluded.

The president, Mr W. Crisp, replied, but complained that insufficient attention was drawn to the wholesaling industry.

Mr T. D. Woods proposed the toast of the Past Presidents, a number of whom were present, and Mr T. Donovan, president in 1914, replied. Mr Donovan spoke particularly of his year of office saying that the same principles of trading relationships existed then as now. He paid tribute to the late Mr A. G. Beaver, and in conclusion urged that persons coming on to the register should be thoroughly vetted on the same basis as member firms.

The toast of the Guests was proposed by Ald J. W. Mayall, and Mr R. D. McCraith, president of the E.C.A. of Scotland, replied.

notes on wiring

by Megohm

IN these Notes of 22nd April 1954 I discussed specifications in general and recently a foreman electrician remarked that the matter of working drawings had not been covered. I agreed that these are of major importance and left him quite happy in the knowledge that I would rectify the matter as soon as possible.

Working Drawings

Together with a specification, working drawings provide the story behind a new building or alterations to existing buildings. These drawings should show quite clearly the positions of lighting points, switches etc. and these should agree, in number, with the schedule of points in the specification. Too often there is some slight variance which delays the estimator or even the site foreman. I do not agree with the method of showing the positions of the points and switches on drawings prepared by the architect for the builder's use. These drawings are usually well filled with sundry instructions and pointers to special situations. This, together with the room names or numbers, tends to make it difficult for the electrical contractor to follow when the electrical symbols are then drawn in. I agree that it is important for the electrical contractor to be in full possession of the building details, but I consider such an arrangement on the drawings gives neither building nor electrical details clearly enough to be understood, and I consider the matter is best dealt with as follows.

A drawing showing the building lines with door swings, windows and other similar features should be prepared. Care should be taken to position room names or numbers *outside* the rooms in order to leave the space clear for other symbols. Staircases, lift wells and fanlights should be shown and, if possible, the positions of water tanks etc. in roof spaces in order that the contractor can allow for diverting his conduit and/or trunking runs. Vertical shafts should be indicated and some guidance as to what other services are likely to occupy these also. This indication will be appreciated for instance if the hot water or gas services are to be installed there. Dimensions of shafts, and ducts should be shown and, if some specific run of conduit and/or cable is anticipated in these, some instruction in siting the run in the shaft or duct must be given together with the method of fixing. I realise that the method of fixing has probably been covered in the specification, but some indication should also be given on the drawing as this document is usually carried round by the site foreman and is, in fact, his bible. It is for this reason that I always make certain that the site foreman is well supplied with copies of working drawings. He requires, in my estimation, at least five copies of all electrical drawings. Two of these should be kept in his office at all times, in order that details can be marked for the preparation of "as installed" drawings.

Drawings showing sections through the building are always prepared by the architect, and I consider it necessary to incorporate at least one of these in the electrical drawings. A typical section should be chosen and the necessary lines indicating which part of the building the section shows should be clearly defined.

As I mentioned earlier, it is important that the contractor is fully conversant with the building work. In the case of new buildings a good guide to this can be given in the electrical drawings. It is a different matter, however, where alterations and additions are being made to existing buildings. There is usually a great deal of cutting away and blanking off involved in this type of work and this necessitates alterations to the internal services. Most specifications demand that the contractor visits the site in order to acquaint himself with site conditions and I consider that a complete set of builder's drawings should be available on site during the tendering period. Enough information should be obtained from them for a proper estimate to be submitted. It is also of some assistance if the builder's drawings are coloured in the appropriate manner. These coloured drawings are, in my opinion, very useful on the site and I wish architects would consider supplying one set in a frame in order that it remains in a clean condition throughout the length of the contract. It is equally important that the building contractor is well supplied with electrical drawings for a competent general foreman can save a lot of trouble.

Symbols

Another very important matter in the preparation of working drawings is the use of correct symbols for general electrical purposes. These symbols are clearly set out in Appendix 2 of the I.E.E. Regulations and there are on the market today stencils, for the marking up of drawings, which are based on the official symbols. These are quick and easy to use and give a neat, tidy finish to a drawing. Each drawing should be correctly numbered and I consider that this number should be kept as short as possible. If the name of the building is clearly shown then a short reference number should be sufficient. Revisions to drawings should be noted when these are necessary and, in some cases, I find it most useful to detail these in a column at the side of the drawing. By this method, there is little disagreement between the parties concerned when the final account is prepared. Of course, on a very large installation this is not practicable and the consultant is faced with the problem of keeping track of the revisions including those which are carried out on verbal instructions due to some unforeseen circumstances during the day's work.

A line diagram showing the fuseboards and switchgear is a useful addition to the drawings. With some careful planning put into it, such a drawing can greatly assist a site foreman in planning his circuits and avoiding "two phase" situations with regard to sockets etc. He can be assisted even further by the circuit numbers being shown the symbol for the lighting points and switch-sockets.

From these general observations, which I make in the light of experience in both spheres of the industry, it will be gathered that many drawings do not give sufficient information for the carrying out of the work. May I end by submitting that the technical schools could assist much more in this matter by spending a little longer in the instructions given to their pupils in reading drawings.

South African Market Warning

A FURTHER warning of the growing competition in the heavy electrical equipment market in South Africa, is given in a report just issued by the Board of Trade. With little likelihood of any immediate orders being placed for generators (apart from comparatively small sizes where German competition is very keen), the report refers to prospects in the switchgear, transformer and transmission equipment fields. The U.K. is still the largest supplier of power station switchgear (although U.S. firms have endeavoured to infiltrate with low quotations and quick deliveries), while industrial switchgear is mainly assembled locally from parts imported in Britain, it is stated.

In the transformer field the position is not so bright. There are apparently seven manufacturers in the Union who can handle transformers of up to 1,000 kVA, 33 kV, and one firm is known to have gone up to 3,500 kVA. Preference of up to 10% is given by Escom and the Municipal undertakings to the locally-manufactured product, and within that category it is normal practice to purchase locally. Escom has had difficulty in obtaining import permits for transformers of up to 1,000 kVA, 33 kV.

In the field of larger transformers, competition is rapidly increasing. The recent case when the city of Cape Town ordered two 30 MVA, 66 kV transformers from Britain although eight foreign firms quoted lower prices, may be recalled. It is stated that Escom recently negotiated a contract to purchase two 45 MVA transformers from Holland on price and delivery. Although the general impression that, in this category, U.K. prices are fully competitive with those of foreign firms, it is further emphasised that manufacturers must keep to their delivery promises, and if possible, quote firm prices.

Italian Line "Hardware" to be produced in U.K.

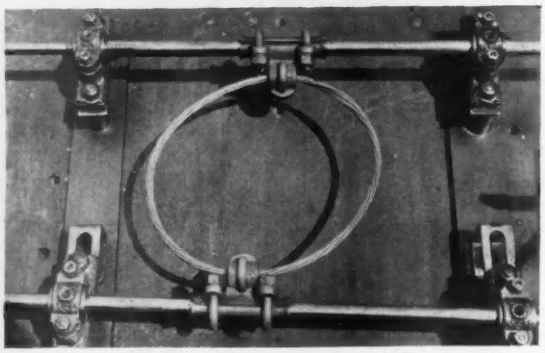
WITH the coming registration of the English Salvi Co., fittings for overhead lines designed by the well-known Italian firm, Soc. A. Salvi and Co., of Milan, are soon to be manufactured in Great Britain. Hitherto, these fittings—mid span joints and dead ends of the compression type, and suspension and strain clamps among others in which this company specialise—were made only in Italy and, for several reasons, were unobtainable for use in this country by the B.E.A.

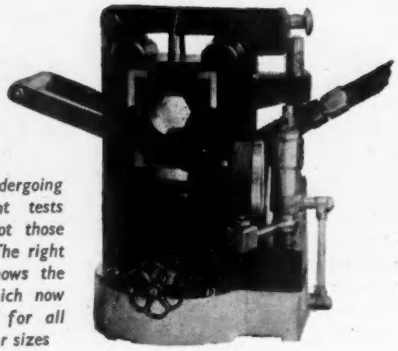
At present, the sole representatives of the Salvi Co. in Gt. Britain are Ferrum (England) Ltd., under whose aegis the English Salvi Co. is to be formed. As a prelude to its formation they held a demonstration of the use of the Salvi compression joint last week at the testing laboratory of Messrs R. H. H. Stanger at Elstree. Joints and dead ends were fitted to two sizes of standard s.c.a. conductor 0·175 sq in. and 0·4 sq in. (copper equivalent). In each size two test lengths were made up—a single length with dead ends only fitted and a double length joined in the centre by a compression joint.

Making the joints and dead ends is a straightforward operation, following conventional practice for compression joints, apart from the omission of grease of any kind. A standard Salvi compressor is employed with, however, hexagonal dies which avoid the ovulation attendant on the use of circular dies. The absence of grease is notable, the joint being claimed to be waterproof with dry conductors.

The lengths of conductor then underwent normal tensile tests to destruction. All four lengths gave the impression of having complied with the B.E.A.'s acceptance requirements; although in the case of the mid span joint on to the 0·4 sq in. conductor, the joint appeared to fail at the 95% of ultimate strength limit, at which it is required to hold for 60 secs. The actual load at failure in this case was 28,500 lb, one conductor starting to pull out from the central joint; although the steel cord also appeared to fail simultaneously.

Initial production of fittings will be confined to joints and dead ends, although later the full Salvi range is to be produced. A recent newcomer is the line spacer for use on circuits where twin conductors per phase are employed. Completely flexible, the spacer takes the form of a stranded steel ring made up of a single galvanised steel wire wound up on itself to form a spiraloid. It is held to each conductor by clamps simpler in design to those used in suspension. Being flexible, the steel ring allows the conductors to move vertically, horizontally and laterally in relation to each other, whilst the restoring force of the spring is always available to keep or force them apart under abnormal weather conditions. Mechanical tests involving displacement of the clamps in opposite directions of about 100 mm and angular movement of one clamp, together with conductor, on its longitudinal axis through 30° were carried out simultaneously at a frequency of some 350 movement/min. After some 10 million movements on a number of clamps, no ill-effects are stated to have been observed.



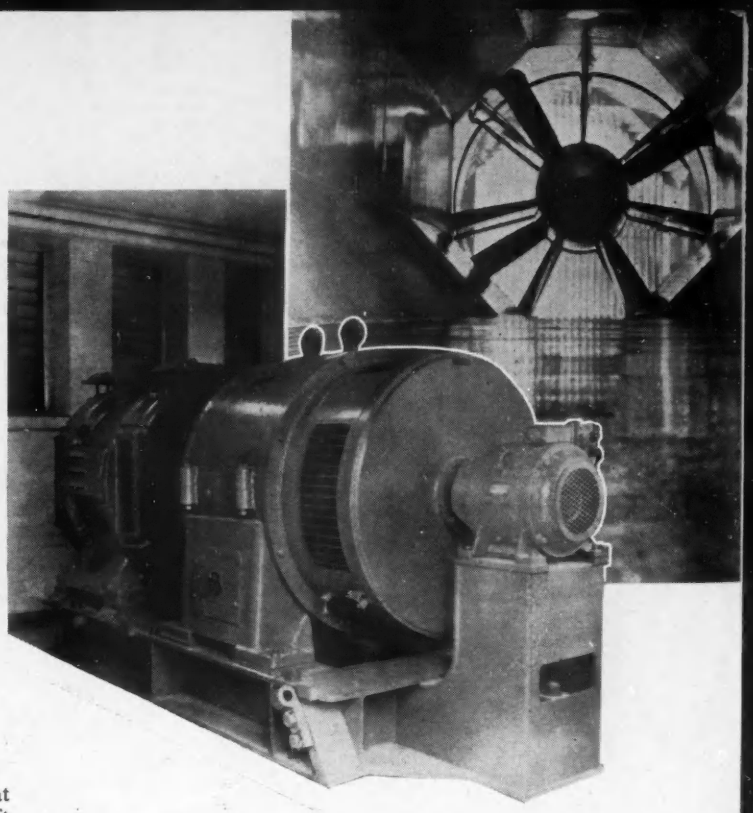


Left, Salvi spacer undergoing lateral displacement tests (the clamps are not those used in service). The right hand illustration shows the compressor unit which now has hexagonal dies for all standard conductor sizes

Electrical Times, 1 July, 1954

Power Plant for a Wind Tunnel

CLOSE CONTROL OF AIR SPEED A FEATURE OF INSTALLATION



Power for the four bladed 12 ft dia fan (shown uppermost) is supplied by a 500 h.p. d.c. motor fed by this 600 h.p. motor generator set housed in the motor room. The view also shows the 3 kW pilot exciter mounted on the same shaft

FACILITIES for aircraft research and development at the Hatfield Aerodrome of the de Havilland Aircraft Co. have now been augmented by the recent installation of a new wind-tunnel for testing scale-model aircraft. Power and control of the fan is effected electrically with plant supplied by the British Thomson-Houston Co. to meet two essential requirements of wind-tunnel testing—a wide range of air speed and close control of the speed at any given value. These are effected by employing Ward-Leonard connections for the fan motor, maintaining it at any given speed by a control system of the closed loop type.

The tunnel is of the closed air-circuit type, the same air being continuously re-circulated, and is roughly rectangular in plan. All the heavy electrical equipment is housed in a motor room adjacent to it. This enables the fan to be close coupled, through a 28 ft. long shaft, to its driving motor. The latter is a d.c. machine, having a continuous rating of 450 h.p. and a two-hour rating of 500 h.p., at 460 V and 800 r.p.m. With the Ward-Leonard control a speed range of four to one is obtained, the maximum air speed being 250 ft/sec, some 170 m.p.h. Provision is made for rapidly stopping the motor by dynamic braking in case of emergency, the system bringing the motor to rest from full speed in about five seconds.

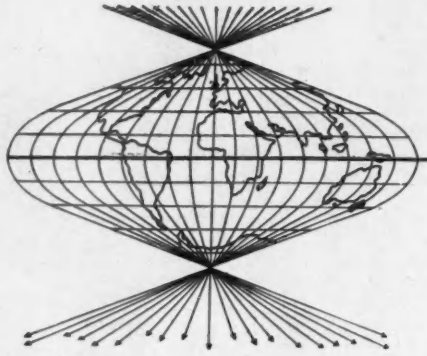
Fan motor supply

Power for the fan motor is derived from a 400 kW, 460 V d.c. generator driven by a 604 h.p. 2·87 kV, 3-phase 50 c/s slip-ring motor. A 3 kW, 250 V exciter is also mounted on the m.g. shaft. Apart from starting and protective gear for the m.g. set, the motor room also houses the main contactor panel carrying control and protection gear for the Ward-Leonard connections, the dynamic breaking components and the electronic speed regulator panel. On the latter is mounted the thyratron rectifier from which the generator field is supplied and the speed control amplifying circuit.

Once the m.g. set has been started, all further operations may be carried out at a control desk located near the working section of the wind tunnel, although provision is made to effect control from the motor room should this be necessary. Apart from aerodynamic controls, the desk is fitted out with various push-button controls, indicator lights, a speed control rheostat for the fan motor and instruments. If and when necessary the fan speed, normally automatically controlled, may be varied manually with coarse and fine controls also incorporated in the desk.

In automatically controlling the fan motor speed to within close limits (±0·15% at maximum revolutions), the regulating system depends on the principle of balancing a small signal voltage proportional to the output speed against a comparable reference voltage. The latter is derived from the speed control rheostat and is hence proportional to the desired value. The signal representing the actual speed is supplied by a specially designed p.m. pilot generator coupled to the fan motor. Any departure, therefore, in speed from the pre-set value destroys the balance between the two signals, the out-of-balance voltage, suitably amplified, being then fed to the thyratron circuit altering the generator field excitation to restore the fan speed to its previous value. Sufficient amplification is available to ensure that the range of excitation is adequate to overcome all likely disturbing factors.

Protective devices on the panel include current limiting circuits designed to restrict the motor current to a safe value during acceleration and retardation by exerting an overriding control of the thyratron voltage. Stabilising feed-back circuits are also incorporated to prevent hunting. When it is required to maintain the fan speed other than automatically, provision is made by two means. As mentioned previously, one method employs coarse and fine controls regulating generator field current, which is then supplied direct from the exciter. In the other method, the generator field is supplied from the thyratron, but the amplifier circuit is by-passed, control of the circuit being effected from the speed regulator on the control desk.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Consumption in Winnipeg

An average annual consumption of 7,037 units—that was the exceptional figure achieved by the 54,489 domestic consumers served by the City of Winnipeg Hydro-Electric System during 1953. According to the annual report, the average net bill was $52·74, and the price per unit, 0·749 cent. During the year a further 4,138 consumers were connected, bringing that total to 151,049 at the end of December last. Total electricity consumption amounted to 630 million units (an increase of 4·3%) plus 144 million units at off-peak (decrease of 10·4%). Net profit for the year was $716,225 of which $600,000 has been transferred to the city's general revenue account. The Pointe du Bois and the Slave Falls hydro-electric plants were responsible for all but a minor amount of the power generated, but at the Amy St. steamplant a further 25 MW set has been installed. Consultants have been engaged to advise whether the Pointe du Bois plant should be rehabilitated or completely rebuilt, and the anticipation of meeting substantial costs incurred in such work, among other things, causes Mr H. L. Briggs, the general manager, to ponder on the financial future of the undertaking.

Sales Warning

A warning that the Saskatchewan Power Corporation might enter the appliance retail field unless the existing retailers adopted more enterprising methods, was hinted at by Mr J. R. Sarsfield, business manager of the Corporation, in an address to the Retail Merchants' Association. He said the only way the Corporation's investment of $70 millions would be justified was by thorough utilisation of the power resources. They were not planning to enter the retail appliances field, but they would not relinquish their interests or right to do so if it was necessary to look after their investment. He warned the retailers that if they wanted that lucrative field left to them, they must look to it. The potential market for electrical equipment was expanding at a rate of $6½ millions per year and could exceed $12 millions, he estimated. Speaking of the high cost of power in Saskatchewan and the responsibility of retailers in lowering it, he said rates would go down only with an increase in consumption, which in Saskatchewan was now far below the level in other provinces. Low-cost power was unlikely to come in our lifetime unless business men became as militant as they are about increasing utilisation of power resources.

U.S.A.

Generator Contracts

Although the English Electric Co. and other overseas firms submitted lower tenders, orders have been placed with the Westinghouse Electric Corporation for two generators for the Chief Joseph dam in Oregon, and for two generators for the Dalles dam in Washington State. The American tender price for the first contract was £778,820; and for the second £298,500. The prices quoted by the English Electric Co. were £705,867 and £219,210 respectively, it is stated. Continental firms also submitted low figures, we understand. Both power projects are situated in the Columbia river basin. It will be recalled that just a year ago the English Electric Co. was given an order for ten 103·3 MVA transformers for the Chief Joseph dam project, and the Westinghouse Co. the contract for four 100 MW generators for that scheme, after revised tenders had been submitted, although earlier, in a combined tender for the whole equipment the British company quoted a substantially lower price than the nearest American competitor. The subsequent "hedging" by the U.S. Army Corps of Engineers aroused considerable controversy.

S. AMERICA

Colombia Progress

Although it was hoped that the Anchicaya hydro-electric station in Colombia, would have its first stage of 16,000 kW of plant in operation in Aug. next, it now seems that the station will not be in commission this year, according to reports. It seems that the company concerned is raising additional capital in order to finish the work on the first stage. Meanwhile the power position in Cali remains acute. We have already reported that a large number of power development schemes have been prepared for various parts of Colombia, both for company undertakings and municipalities, and these are being supervised centrally by the Institute of Water Supply and Electrical Development. It is now reported that the Departments of Caldas and Tolima are studying the formation of Electric Supply Co-operatives. Funds from the coffee export tax are to be allotted for the development of one hydro-electric plant in Caldas and two other similar schemes are being considered. In Tolina, 12 million pesos have been allotted for a 4,500 kW hydro-electric plant on the Rio Recio. There is also news that a German concern has offered to finance the construction of a 25,000 kW hydro-electric station proposed for municipalities in Western Antioquia.

NORWAY

Hydro Power First

Norway, a country associated with the development of heavy-water, is not keenly interested at the moment in the possibilities of atomic power stations. Dr. Gunnar Randers, director of atomic research, has explained that Norway now generates hydro-electric power at under ½d. per unit. As present estimates of atomic generated electricity is about 1d. per unit, it is evident that the exploitation of first class Norwegian water-power resources will still be an excellent proposition in the future. But when all suitable resources have been utilised in about 30 years' time it may be necessary to adopt atomic energy in Norway to secure more electricity, he added.

AFRICA

A High Line

It will be about another six months before definite orders for equipment for the 260 mile long 132 kV line from Uganda to Nairobi can be placed. The Kenya Power Co., the subsidiary formed by the East African Power and Lighting Co. to which we referred on 17 June, is applying for the necessary 50 years' licence to take the bulk supply from the Uganda Electricity Board, to commence in 1957. Preliminary investigations of the route of the transmission line have already been made, and apart from it being jungle and mountainous in parts, no great difficulty is contemplated, although in places the line will be about 9,000 ft above sea level. It seems more than likely that Balfour Beatty and Co. Ltd., who undertake much

of the constructional work for the East African Power and Lighting Co., will be the contractors for this job also.

Consultants for Rhodesia

Two consultants nominated by Electricité de France, M. Tisno and M. Misson, have arrived in Salisbury, S. Rhodesia, this week, to advise the Federal Government on engineering aspects of the Kariba and Kafue hydro-electric schemes. Announcing their appointment, Sir Godfrey Huggins, the Premier, said their selection was based on three major considerations. Firstly, they had to be of such standing that their report would be entirely acceptable to any potential lender of finance; secondly, that they should be completely independent and not in any way connected with those at present interested in the two schemes, and finally, that they had to be immediately available. The president of the International Bank has welcomed the appointments, considering that they are likely to facilitate the work of the Bank Mission which will be sent to the Federation within the next few months.

MIDDLE EAST

Large Greek Order

The English Electric Co. Ltd. has arranged a contract, involving £6,628,000, with the Athens-Piraeus Electricity Co. (a subsidiary of Whitehall Securities Ltd.) which supplies electric power and transport in the Athens and Piraeus area. That sum is to be expended on the renovation and extension of the Athens-Piraeus Electricity Co.'s power station at St. George's Bay, near Athens. The loan, in the form of generating plant and transmission equipment, designed to add 72·5 MW to the station's existing capacity of 132 MW, to be supplied by the English Electric Co. Ltd. It is claimed that this is the largest single order placed with a British firm in Greece since the war. The actual cost of the equipment and services to be provided amounts to £5,400,000, we understand. Financial charges and bankers' commissions add a further £688,000 to enable payment to be made by instalments over 7½ years. A £540,000 provision is made to cover possible increases in the cost of materials and labour during the manufacturing period. The new power plant, which is to be installed by 1956, will be capable of burning either pulverised lignite or oil. The new equipment includes a 60 MW hydrogen-cooled turbo-alternator and a 12·5 MW turbo-alternator exhausting into the existing turbines, three boilers operating at 930 lb/sq in., 915° F, switchgear for the control of the alternators and auxiliaries, building extensions and a quantity of substation equipment including switchgear.

Possible Market

There should be considerable possibilities for rural electrification in Iraq when the new electricity generating programme of the Development Board (to which we have already referred), comes into operation, particularly in view of the finance being available from the mounting oil revenues. As one indication alone, according to a report by Dr K. G. Fenelon, of the Iraqi Ministry of Economics, water power in the form of primitive water wheels is utilised for farm purposes in a large number of holdings. Only in a few instances are electric motors utilised at present.

AUSTRALIA

Victoria's Aim

Every city, town and hamlet in the State of Victoria, would have electricity laid on by 1960, Mr Galbally, the Minister for Electricity Undertakings, has declared. The statement was made when he officially inaugurated a new Mildura power station of the State Electricity Commission at Red Cliffs, about five miles from Mildura. He said the Commission was connecting more than 500 new consumers each week. Extensions into the country were being made faster than ever before. The Mildura station consists of two 5,000 kW "packaged" steam generating sets.

Brisbane's Expenditure

For the financial year commencing this month, the Brisbane City Council has a record loan works programme involving about £7,800,000. For the past year the sum amounted to £5,800,000. In the current programme, Tennyson power house and other electricity projects will account for nearly £4½ millions. The new financial year is expected by the council to involve the heaviest expenditure of any year on the Tennyson project, which is not scheduled to be completed until 1958. The Council has no assurances yet that money will be available for the works, mainly electricity, water and sewerage. Unless the Council sees reasonable prospects within a few months of raising the money, the programme will have to be reduced by at least £1,500,000.

NEW ZEALAND

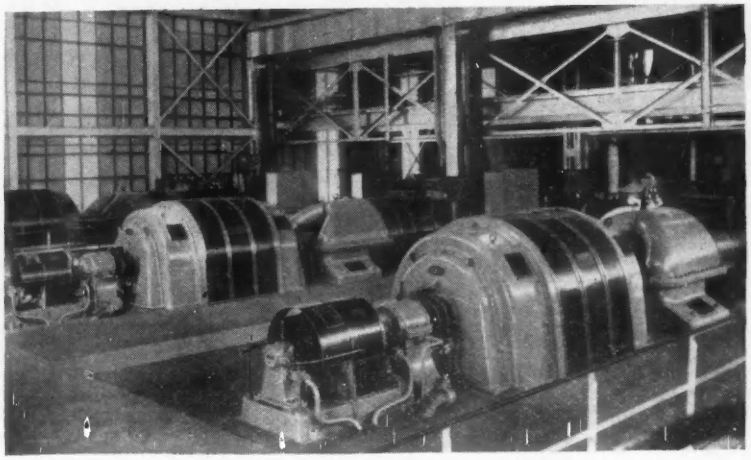
Braeburn Scheme

The New Zealand Cabinet has now approved the construction of the Braeburn hydro-electric scheme in the South Island. Mr S. Goosman, Minister-in-charge of the State Hydro-Electric Department, has announced that provision will be made in this year's estimates for preliminary construction work on the project. He said the capacity of the initial stage will amount to 30 MW, but later this will be doubled. Construction work will involve a five-mile tunnel from Lake Rotoroa to the power house at Tutaki Valley. It was earlier planned that the Braeburn scheme would be the first phase in a long-term scheme, extending over about twenty years, which would provide over 200 MW for the South Island grid.

THAILAND

Diesel Plant First

Although plans have been drawn up for the erection of steam plant to meet the increasing demand for power in the Bangkok and Thonburi districts, the National Energy Council for Thailand is considering the installation of diesel plant as an urgent measure. According to reports, it is likely that 10,000 kW of diesel power plant may be obtained. Of these two other power stations planned, the major project is for a 20 MW steam plant.



Now complete is the first stage of the Howard power station of the Wide Bay Regional Electricity Board, Queensland, Australia, shown alongside. There are three 7,500 kW turbo-alternators, supplied by the General Electric Co., Ltd., together with a 750 kW house set. The boilers are of Riley Dodds manufacture. Situated on the Burrum River, 17 miles north of Maryborough, and within a few miles of the Burrum coalfield, the station is planned to have an ultimate capacity of 52,500 kW. The station has been designed to supply an area of over 16,000 square miles having a population of some 92,000. The three main machines generate at 11 kV, three-phase, 50 cycles. The alternators follow the company's standard design for machines of that output and use a closed air cooling system, the fans being mounted on the rotor shafts. Steam is supplied at 400 lb/sq in., 750° F. The 750 kW house set supplies power for the station auxiliaries at 485 V

Personalities

IN THE INDUSTRY

Previously district engineer in Edinburgh with the South East Scotland Electricity Board, **Mr K. D. Hodgson,** A.M.I.E.E., has been appointed deputy chief engineer of the Bermuda Electric Light Co. Trained with the Carlisle Corporation Electricity Department, Mr Hodgson subsequently held various posts with that undertaking, the Huddersfield Corporation undertaking and the Yorkshire Electricity Board before going to Edinburgh five years ago. During the war he served with the Indian Engineers and the R.E.s, being demobilised with the rank of staff captain (electrical and mechanical). Mr Hodgson sailed for Bermuda a few days ago.

Mr Peter G. Roberts, M.P., has been appointed chairman of the Wellman Smith Owen Engineering Corporation, Ltd. He succeeds as chairman **Sir Samuel Roberts,** who although remaining on the Board had expressed a desire for reasons of health to be relieved of his additional duties as chairman.

Head of the Electrical Engineering Department of the Regent Street Polytechnic for the past 5½ years, **Mr W. H. Date,** B.SC.(ENG.)., M.I.E.E., is to retire later this year, some time after October, we learn. Mr Date, who succeeded Mr Philip Kemp in his present post, was trained in electrical engineering at the Northampton Institute. Obtaining his B.SC. at London University in 1913, he was a student apprentice with Standard Telephones and Cables Ltd. After war service with the R.F.C. as staff officer connected with technical training of air crews and ground staff, he became assistant lecturer and demonstrator in electrical engineering subjects at the Regent Street Polytechnic in 1919. Later he became senior lecturer, and in 1945 senior assistant to the Electrical Engineering Department, and was promoted to his present post late in 1947. During the last war he was responsible for the basic training of Army personnel as radar mechanics, when about 3,000 students passed through the Electrical Engineering Department. He is also author of books on electrical and radio technology. Our readers who have studied under Mr Date's tuition will wish him a long and happy retirement.

Now with the Norfolk sub-area of the Eastern Electricity Board, **Mr G. E. Collier,** A.M.I.E.E., A.M.I.B.A.E. has been appointed commercial officer of the North of Scotland Hydro-Electric Board's North Caledonia area. Mr Collier, who entered the supply industry in 1929, has served successively in the commercial departments of the Edinburgh, Stafford and Norwich Corporations prior to nationalisation. He received his technical training at the Heriot-Watt College, Edinburgh.

Formerly branch manager at Hayle to the South Western Electricity Board, **Mr R. L. Cleave** has been promoted to district commercial engineer for the Board's East Cornwall district. The new branch manager at Hayle is **Mr G. H. Rickard,** previously commercial assistant, Central Cornwall.

Mr C. E. Collins, of Collins Electrical Ltd., was elected chairman of the Association of Electrical Machinery Trades at the annual meeting last week. The new vice-chairman is **Mr F. H. Washington,** of E. J. Wilcock Ltd, with **Mr E. W. Clark,** of C.S.S. Electrical Co., Ltd, as treasurer.

The attempt to blow up transmission line pylons on the England - Scotland border last November is recalled by the notice of the award of the Queen's Commendation to **Mr T. P. Drover**, an employee of the South East Scotland Electricity board stationed at Galashiels. Mr Drover is commended for his gallant conduct while inspecting the Galashiels-Dunston overhead line on 24 Nov. last. While on this routine patrol he found that on each of two of the legs of a tower there was a bundle of gelignite, each primed by a detonator and set by an alarm clock. He removed the detonator from the explosives, preventing possible serious damage, and informed the police.

Mr F. Key, A.M.I.E.E., the new district commercial engineer at Falmouth (Central Cornwall) to the South Western Electricity Board, was formerly first assistant district engineer at Minehead. He is succeeded in the latter position by **Mr G. A. R. Dickinson,** previously of Taunton.

The Plessey Co., Ltd., has formed a new Division of the company, to be known as the Swindon Components Division, which will be responsible for the development, manufacture and sale of electrolytic and paper capacitors and moulded track potentiometers. Appointed general manager of this new Division is **Mr O. G. Cox,** who was previously in an executive position in the Components Division at Ilford. He will be located at Swindon where the new Division's activities, under existing management, are now concentrated.

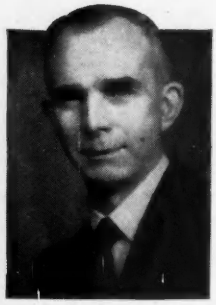
We hear that the new chief generation engineer (construction) to the London Division of the B.E.A. is to be **Mr W. B. Shannon,** M.INST.C.E., M.I.MECH.E., M.I.E.E., F.A.S.M.E., who since 1948 has held a similar post with the South Eastern Division of the B.E.A. He succeeds the late Mr C. A. Clench. Prior to nationalisation of the Industry Mr Shannon had been chief assistant constructional engineer to the London Power Co., Ltd since 1934, in which position he was particularly concerned with the Deptford power stations and with Battersea "A" and "B" stations from the project stages onwards. Earlier, he held various engineering positions with the London Electric Supply Corporation Ltd. He served his apprenticeship at the Parkhead Steelworks and Dalmuir Engine Works of Wm. Beardmore and Co., and

Mr K. D. Hodgson

Mr W. H. Date

Mr C. E. Collins

Mr O. G. Cox



Mr W. B. Shannon

was educated at the Royal Technical College, Glasgow. After war service he attended the Royal Ordnance College before joining the Scottish Boiler Insurance Co., and gained further experience with Babcock and Wilcox Ltd. He has contributed to numerous Institution papers and was joint author of "Expanded Tube Joints in Boiler Drums" read before the I.E.E. and I.Mech.E. in 1945. He has also served on B.S.I. Committees having a bearing on power plant.

Mr R. C. Barton, B.SC., A.M.I.E.E., A.I.I.A., formerly deputy sub-engineer, at Devon, to the South Western Electricity Board, has been appointed Bristol district engineer in succession to **Mr C. J. Blackett** who is now commercial manager for Bristol South. Mr Barton has contributed a number of articles to THE ELECTRICAL TIMES.

Appointed president of the company of engineering consultants, Ewbank and Partners (Canada) Ltd, recently formed by Ewbank and Partners Ltd. (see 6 May issue) is **Kenneth F. Tupper,** until recently Dean of the Faculty of Applied Science and Engineering at Toronto University. Between 1947 and 1949 he was director of the Engineering Division of the Canadian Atomic Energy Establishment at Chalk River. Earlier he had been with the National Research Council and Turbo Research Ltd, on research and design for gas turbines.

Dr S. Whitehead, M.A., PH.D., M.I.E.E., F.INST.P., Director of the Electrical Research Association, has been elected chairman of the Committee of Directors of Research Associations.

We are now able to reproduce the photograph, below, of **Miss Mary J. Cumming,** senior demonstrator in the Clyde sub-area of the South West Scotland Electricity Board, who, as we reported last week, has been awarded the 10th Travelling Exhibition by the Caroline Haslett Trust. Miss Cumming is to visit Finland.

Mr C. J. Penny is resigning his position with Mersey Cable Works Ltd., as sales engineer in London and Southern Counties, to take up a similar position with the Brush Electrical Engineering Co. in their London office. Mr Penny was educated in Southampton and served his apprenticeship in that town with J. I. Thornycroft and Co., Ltd. During the war he served as an electrical engineer officer in the Merchant Navy, mainly with the Union-Castle Line and the Brocklebank Line. After the war he spent a few years with the Buckingham and Carnatic Co., Ltd., in Madras, India.

The newly erected Dekhelia power station, Cyprus (to which we made reference on 29 April), was visited recently by his Excellency the Governor of Cyprus, Sir Robert Armitage, K.C.M.G., M.B.E. Our accompanying photograph taken on that occasion, shows Sir Robert being introduced to **Mr M. Simm,** of John Thompson (Water Tube Boilers) Ltd. Others in the group include, from left to right, **Mr C. A. Henderson,** of Metropolitan-Vickers Electrical Co., Ltd., **Mr R. F. Hook,** of British Insulated Callender's Construction Co., Ltd., and **Mr T. S. C. McIwain,** secretary and chief accountant to the Electricity Authority of Cyprus.

An official visit to Dekhelia power station

Mr F. R. M. De Paula, C.B.E., F.C.A., has resigned his directorship of Electric and Musical Industries Ltd, to facilitate the appointment of **Mr J. F. Lockwood,** who has accepted a seat on the board. Mr Lockwood is chairman and managing director of Henry Simon Ltd, and is a director of National Research Development Corporation.

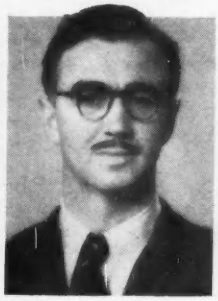
The Thermovent Heating Division of E. K. Cole Ltd. announce the appointment of **Mr J. D. Kendall** as technical sales representative for Yorkshire, the northern area of Nottinghamshire and Northern Lincolnshire, including Lincoln. He may be contacted c/o 73 Carr Manor Avenue, Leeds, 7. Before joining E. K. Cole Ltd., Mr. Kendall was at the Leeds branch of Falk, Stadelmann and Co., Ltd.

A director of the General Electric Co., Ltd., and manager of the Osram Lamp Department, **Mr W. H. Williams** has expressed his desire to retire on 30 June. He has, however, agreed to be retained in an advisory capacity for a further period of six months until 31 Dec. **Mr A. E. Page,** who joined the company in 1915, who was appointed assistant manager of Osram Lamp Department in 1930, and became sales manager in 1946, is taking over the full management of the Department from July 1.

Purchasing manager of Standard Telephones and Cables Ltd., New Southgate, **Mr W. C. Bennett** retired at the end of June after 44 years service. He joined the staff of the United River Plate Telephone Co. in 1910 as assistant buyer, and later served as commercial manager. After some twenty years with that concern he was transferred to Standard Telephones and Cables Ltd. His successor at the company's New Southgate location is **Mr S. F. Monk.**

Appointed as senior assistant engineer (overhead lines) to the Yorkshire Electricity Board is **Mr F. R. Haigh,** B.SC.(HONS.), A.M.I.E.E., ASSOC.I.MECH.E., who is now district engineer for No. 2F district of the North Western Electricity Board. Mr. Haigh was born in Leeds, and gained early experience in that city, first with Flather and Co. and then Ernest Jones and Co. He also attended Leeds College of Technology and gained his B.SC.(HONS.) degree in electrical engineering at Leeds University. Joining the Yorkshire Electric Power Co., Ltd., he spent some time in the overhead mains operation and maintenance departments and later served as a field engineer. In May 1942 he was transferred to the South Yorkshire area of the company as assistant district engineer, but eighteen months later left the supply industry to take up the post of senior lecturer in electrical engineering at Wigan and District Mining and Techni-

Miss M. J. Cumming



Mr C. J. Penny

Mr J. D. Kendall

Mr A. E. Page

Mr F. R. Haigh

cal College. He held that position until Mar., 1946, when he was appointed borough electrical engineer and manager to the Farnworth Corporation, a position he held till vesting day. From November, 1949, until Apr., 1951, he was installation engineer (appliances) for the No. 2 sub-area of the North Western Electricity Board, and he became district engineer at Kearsley in Apr., 1951.

Mr T. A. St. Johnston, A.M.I.E.E., who recently celebrated his 70th birthday, has retired after thirty-seven years with the Micanite and Insulators Co., Ltd. He commenced his career at the British Thomson-Houston Co., Ltd., Rugby, in 1901, later joining West Ham Corporation and then St. Marylebone Electricity Department. To mark their appreciation of his activities the Foremen's Association, the Long Service Association and M. and I. Sports Club made presentations to Mr St. Johnston. From the Sports Club he received a pair of binoculars, an appropriate gift, for he is by no means retiring into seclusion. After a visit to South Africa, where he hopes to make many trips inland, he plans to return to his farm in Essex. A man of varied interests and hobbies, Mr St. Johnston is well known as an enthusiastic radio amateur, licensed since 1923. His call sign is G.6.UT.

Sir Frederick Brundrett is shortly to become Chief Scientific Adviser to the Minister of Defence in succession to **Sir John Cockcroft,** we understand. He is at present Sir John's deputy. The appointment is expected to take effect on 1 Aug., the day on which the Atomic Energy Corporation takes over responsibility for all atomic energy operations in Britain. Sir John Cockcroft is to be a member of the board of this corporation, responsible for research.

Following his election as chairman of E.L.M.A. for the current year **Mr V. C. H. Creer,** M.A., takes the place of Mr C. J. W. Scott to represent that Association on the Electrical Fair Trading Council.

General Sir Hubert Gough has retired from the board of Siemens Brothers and Co., Ltd., after 34 years' service. He was chairman of the company from Feb., 1951, until Apr., 1953, when he resigned from that post.

Mr Conrad P. Haseltine has resigned from the boards of Telephone Rentals Ltd. and two of its subsidiaries.

The President of the Board of Trade has reappointed **Sir Percy H. Mills** as chairman of the National Research Development Corporation and **Professor P. M. S. Blackett, Sir John McL. Duncanson** and **Sir Edward de Stein** as members for a further period. **Sir Henry Hinchliffe** and **Sir Alan Saunders** have been appointed in place of the retiring members, **Sir Edward Hodgson** and **Mr W. E. P. Johnson.**

OBITUARY

Major A. H. L. Howell, A.M.I.E.E., managing director of James Williams (Narbeth) Ltd., died on 19 June, aged 61. He was for some time engineer-in-charge of the Haverfordwest Electricity Works, and managed for some years electricity undertakings in Pembrokeshire established by his uncle, the late Capt. J. L. H. Williams.

Mr W. Angus Scott, M.I.MECH.E., M.I.M.E., who died on 23 June, aged 79, was formerly a partner in the Cardiff firm of consulting engineers, William Angus Scott and Partners. For many years he had been a consulting engineer to colliery and mining companies.

Mr W. E. B. Dove, managing director of Dove and Partners, electrical contractors of Darlington, died recently aged 78. He started in business fifty years ago.

Mr Leslie R. Nixon, M.SC., (ENG.), M.I.E.E., M.I.MECH.E., chief of research and development with J. Stone and Co., (Deptford) Ltd., since 1951, died on 19 June. He joined that concern in 1932 as chief designer. Earlier he was with Marconi's Wireless Telegraph Co., Ltd., for three years as designer, wireless transmitters, after spending six years with the British Thomson - Houston Co., as a machine designer.

Mr W. Simpson, Assoc. I.E.E., M.INST.F., chief generation engineer, operation, with the South West Scotland Division of the B.E.A., died on 28 June, aged 60. He was with the Clyde Valley E.P. Co. for 34 yrs.

Mr F. M. Colebrook, a senior principal scientific officer at the National Physical Laboratory, died on 21 June, aged 61. He was chiefly responsible for producing automatic computing engines. He was also the author of several books, including "Alternating Currents and Transits."

Mr J. L. Eve, M.INST.C.E., M.I.E.E., chairman and managing director of the J. L. Eve Construction Co., Ltd., died on 25 June. He was widely known for his long association with the construction of overhead transmission lines, and will be greatly missed by a wide circle of friends.

Mr George Robertson, who retired from the position of station superintendent at the South Shields power station in 1935, died on 23 June, aged 84.

Mr Frank Hulme, managing director of F. Hulme and Co., Ltd., of Manchester, died on 23 June.

Mr H. D. Wilson, who had been associated with the Sifam Electrical Instrument Co., Ltd., for the past sixteen years, first as technical sales engineer and latterly as a director, died on 23 June. Mr Wilson had spent a lifetime in the industry, from apprenticeship with Messrs Spagnoletti Ltd., followed by more than twenty-five years as a technical and sales executive with other well-known companies before joining Sifam.

I.E.E. AWARDS

THE Council of the Institution of Electrical Engineers has made the following award of Premiums for papers read or accepted for publication during the Session 1953-54.

GROUP A. Institution Premium to *P. M. Hollingsworth,* M.ENG. and *P. A. Raine*; Kelvin Premium to *H. Diggle,* B.SC.TECH., and *E. R. Harthill,* B.SC.(ENG.); John Hopkinson Premium to *D. P. Sayers,* B.SC., *M. E. Laborde,* ING.E.S.E., *L.'es.*SC., and *F. J. Lane,* O.B.E., M.SC.

GROUP B. (*Non-Section Premiums*) to *R. J. Halsey,* B.SC (ENG.), *F. C. Wright, A. H. Roche,* B.SC.(ENG.), *F. O. Roe,* B.ENG., *D. C. Walker,* B.SC.(ENG.), and *J. F. P. Thomas,* B.SC.(ENG.); Llewellyn B. Atkinson Premium to *C. W. Miller,* M.SC.; Extra Premium to *A. Fairweather,* PH.D., M.SC.

Measurements Section Premiums. Silvanus Thompson Premium to *K. J. R. Wilkinson,* D.SC., and *J. D. Harmer,* B.SC.; Mather Premium to *P. J. Palmer,* M.SC.; Extra Premiums to *K. Kandiah,* M.A., *H. McG. Ross,* M.A., *C. W. Oatley,* M.A., M.SC., *J. G. Yates,* M.A., and *A. G. Milnes,* M.SC.

Radio Section Premiums — Duddell Premium to *G. W. Barnes,* B.SC.; Ambrose Fleming Premium to *M. M. Z. Kharadly,* B.SC., PH.D., and *Willis Jackson,* D.SC., D.PHIL., F.R.S.; Extra Premiums to *A. L. Cullen,* PH.D., B.SC., *E. D. Daniel,* M.A., *P. E. Axon,* O.B.E., M.SC., PH.D., *E. A. O'Donnell Roberts,* M.SC., PH.D., *J. A. Saxton,* D.SC., PH.D., *B. N. Harden,* M.SC., *J. Brown,* M.A., *A. Talbot,* M.A., PH.D., *and E. Green,* M.SC.

Supply Section Premiums — Sebastian de Ferranti Premium to *J. S. Forrest,* M.A., D.SC., and *J. M. Ward,* B.SC.; John Snell Premium to *Y. K. Ching,* B.SC., and *B. Adkins,* M.A.; Extra Premiums to *B. C. Robinson,* M.SC., PH.D., *N. Troost,* B.SC. (ENG.), and *F. H. S. Brown,* B.SC.

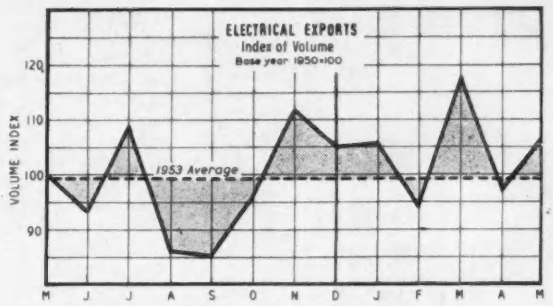
Utilisation Section Premiums — Swan Premium to *C. G. L. Morley*; Extra Premium to *R. F. Sims,* B.SC.(ENG).

GROUP C. Blumlein-Browne-Willans Premium to *G. Dawson,* B.SC., *L. L. Hall, K. G. Hodgson,* B.A., *R. A. Meers,* O.B.E., T.D., and *J. H. H. Merriman,* M.SC.; Fahie Premium to *T. Hayton,* B.SC., *C. J. Hughes,* B.SC., and *R. L. Saunders,* B.SC. (ENG.); Heaviside Premium to *J. F. Coales,* O.B.E., M.A.

Paris Exhibition (1881) Premium to *M. Garreau and F. Nouvion*; Oversea Premium for senior members to *Professor K. Aston,* M.SC. and *Professor M. V. Kesavarao*; Oversea Premium for students and graduates under 28 years of age to *S. Kaneff,* B.E.

Students' Premiums to *M. H. Alder,* B.SC. (ENG.); *E. P. Fowler,* B.A., *W. D. Jackson,* B.SC., *P. J. Bhatt,* B.SC.(ENG.), *A. W. Hales, R. A. Hore,* B.SC., B.A., *Sub.-Lieut. R. E. James* (*L*), *R.N.*, B.SC.(ENG.), *D. Legg,* B.SC., *A. B. J. Reece,* M.SC., and *Margaret K. Weston,* B.SC.(ENG.).

EXPORTS and IMPORTS



Statistics for May

EXPORTS of electrical equipment during May rose considerably over those for the previous month, the quantity for the month being one of the highest this year. The increase is indicated by the rise in the ELECTRICAL TIMES exports volume index, shown above, from its April value of 97 to 106, the level for May. This figure is also considerably higher than that for the corresponding month last year, when it was 100. These index figures are based on 1950 as 100.

In terms of monetary value, electrical exports on which the index is based amounted to £15,310,254. It should be borne in mind, however, that this equipment is that given in Class D, Division 16 of the official account, to which we have added the figures for electric washing machines and refrigerators in our table. These, when added to the total given above give the overall value of electrical equipment exported of £16,241,858, as shown in the table below. That total compares with £16,057,763 for April this year and £17,756,843 for March.

In the exports during May, the value of certain items sent abroad was considerably higher than that in April, notably, for diesel generating sets, mercury arc rectifiers and radio equipment. In the cooking appliances group, electric cookers alone accounted for £74,249 of the total (against £11,139 in April), while the corresponding figures for toasters were £23,779 (£18,284) and for flat irons £70,688 (£66,324). Last month's exports of electric washing machines of up to 150 lb net weight, valued at £252,975, was £35,685 below the figure for the previous month. In the first five months of this year, exports of goods listed in our table totalled £77,622,608.

Australia was our best customer for electrical goods during May, taking equipment valued at over £1,650,000, South Africa being closely behind with a total of over £1,590,000.

Description	Exports value (£)			Imports value (£)	
	Monthly Average 1952	May 1953	May 1954	May 1953	May 1954
Generating Sets:					
Diesel up to 200 kW	408,225	311,869	484,730		
„ over 200 kW	214,949	118,900	390,577		
i.c. driven	31,920	19,804	21,179		
Steam turbine-driven	143,882	—	46,258	34,845	9,293
with other prime movers	31,520	102,876	209,392		
Generators	210,823	366,225	252,463		
„ parts	369,110	625,303	430,500		
Motors	892,465	817,912	916,879	35,989	40,307
Motor starters and controllers	234,035	192,617	167,759		
Convertors and rectifiers	103,602	73,251	132,254	32,159	45,894
Transformers	873,260	815,319	1,038,359		
Switchgear and Switchboards	1,291,656	1,255,044	1,256,188		
Batteries, primary and parts	212,536	225,568	343,158		
Fluorescent and Discharge lamps	53,194	35,895	53,309		
Other lamps	123,932	114,875	116,201		
Radio and Electronic gear	1,916,241	1,860,083	2,482,581	318,712	663,706
Telephone and Telegraph Plant	1,372,016	1,319,314	1,362,143		
Cooking Appliances and parts	114,943	105,151	170,884		
Space heaters	26,489	15,964	30,333		
Water heaters	32,963	31,543	27,735		
Other heaters and parts	128,498	114,325	170,148		
Welding machinery	86,132	141,604	95,799	11,278	8,290
Signalling and Bell equipment	53,722	72,937	50,851		
Commercial Instruments	135,473	137,807	160,314	59,917	41,033
House Service Meters	147,816	126,965	133,573		
Electro-medical and X-ray apparatus	118,910	118,488	118,432	25,920	26,003
Fans	110,447	160,289	202,792		
Vacuum Cleaners	159,303	120,555	156,027		
Other Appliances and parts	232,481	238,098	351,522		
Portable power tools	112,423	161,674	166,156		
Washing Machines up to 150 lb	413,379*	352,554	252,975		
Power Refrigerators, up to 12 cu ft	565,985	773,092	678,629		
Telephone and Telegraph Cables	746,946	771,424	332,397		
Paper-insulated Cables	883,068	904,934	492,973		8,419
Rubber-insulated Cables	622,124	465,164	403,677		
Winding and similar wires	151,677	160,944	93,379		
Other Cables and Wires	276,939	354,512	259,810		
Accumulators and parts	452,491	357,750	322,043		
Insulating Materials	165,900	207,081	121,173		
Electrical Ware	103,886	67,572	67,804		
All other articles	1,595,762	1,471,181	1,678,802	212,491	363,484
Total	16,051,060	15,556,299	16,241,858	673,155	1,212,399

* Including models of up to 250 lb in weight

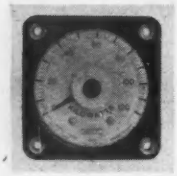
Equipment for Industry

Switchboard Pattern Instruments

MODERN trends in switchboard design call for small, compact instruments taking up the minimum panel space yet giving a clear indication. To meet this demand, ELLIOTT BROTHERS (LONDON) LTD., Century Works, Lewisham, S.E.13, now offer a range of voltmeters, wattmeters and ammeters designed to combine a long scale length with small overall diameter. Attractive in appearance, they are provided with a rectangular outer frame for mounting, of overall size 4 5/16 in. sq, containing a 3½ in. diameter dial having a 6½ in. long scale subtending 240° at its centre.

In all types the moving system forms a complete unit, which, mounted on a moulded base, is fitted into a pressed steel circular case having a rectangular flange to which is attached the die-cast alloy frame. Countersunk holes in both flange and frame provide simple means of fixing. Rubber sealing gaskets are fitted internally making the instruments suitable for use in all applications barring those where excessive humidity is encountered. Platform-type scale plates are used, together with tapered spear pointers to reduce parallax error when reading.

Insulation is such that all movements are stated to withstand a pressure test of 2,000 V a.c. applied for two minutes, twice the length of time required in B.S. 89:1954. The same test voltage may also be applied between the current windings of double-element wattmeters without breakdown. Insulation resistance of voltmeters, ammeters and wattmeters (both between windings and case and between current coils) is stated to be not less than 100 megohms. All meters are individually calibrated, errors at any part of the scale range being within the limits specified for industrial switchboard instruments in B.S. 89:1954. Moving coil voltmeters are available in five ranges, whilst ammeters are available in only one range, 1 mA to 20 A. Maximum ranges of both instruments may, of course, be extended by the use of external shunts.



One of the attractive range of Elliott flush fitting switchboard instruments

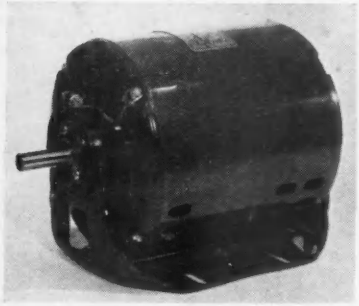
New Surface Coatings

KNOWN as "Epikote" resins, the latest addition to the rapidly expanding range of chemicals manufactured from petroleum are soon to be produced in this country when new plant is completed next spring. Although their first manufacture in Europe was undertaken only a year ago at Pernis, near Rotterdam, the demand for these resins has necessitated the construction, by the SHELL PETROLEUM CO., LTD., Victory Hse, 99 Regent St, W.1, of an "Epikote" unit at their Stanlow Plant in Cheshire. "Epikote" resins, formed from heating a solution of diphenylol propane in caustic with epichlorhydrin, have a wide application in finishes for food containers, domestic electric appliances and similar articles and in the electrical industry. Advantages conferred by using "Epikote" as a base include flexibility, abrasion resistance and adhesive power in the finish.

C.P. Introduce F.H.P. Motor

DESIGNED to meet the requirements of the domestic appliance market both at home and overseas is the new type "A" fractional horse power motor introduced recently by CROMPTON PARKINSON LTD., Crompton Hse, Aldwych, W.C.2. Generally, the motors conform to British specifications in B.S. 170 and B.S. 2048, and the requirements for domestic appliances laid down by the European C.E.E., Dutch K.E.M.A., Swedish S.E.M.K.O., and the Canadian Standards Association.

The new motor is built for either horizontal, vertical or angle mounting, the "Marathon" felt-packed unspillable bearing being used for reliability of lubrication under these conditions. A frame cooling system of unusual design is employed which is stated to minimise temperature rise even under extreme conditions met in hot countries or locations. For the user's convenience, the "Thermatrip" overload protection may be mounted in any one of three positions on the motor end shield.



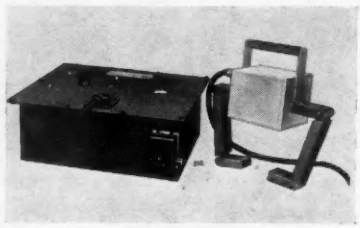
Crompton Parkinson's new f.h.p. motor has a streamline appearance and grey finish

Its design caters for a high starting and pull-out torques, the latter an important requirement for power-wringer drives in washing machines, and it is at present being produced in 1/6 and ¼ h.p. ratings, resilient or solid base mountings and also three or four lug end shield fixings where required.

Portable Magnetic Flaw Detector

MAGNETIC testing of ferromagnetic materials for flaws is a well-established practice and in many cases the "Magco" detector-type MCA, manufactured by the MAGNETIC EQUIPMENT CO., LTD., Lake Works, Portchester, Hants, gives a satisfactory performance when used for double testing. In this process, it will be recalled, the specimen is magnetised in one direction by applying an external magnetic force and then at right angles to this direction by passing a heavy direct current through it. With the type MCA equipment, the second stage is effected by using prods fitted to flexible leads. However, in cases where the work is high up or difficult of access, the MCA unit has proved inconvenient and for such contingencies a new portable tester, type MCJ, has been developed.

It has a lightweight control box which makes for easy handling whilst the provision of adjustable legs on the magnetising unit enables virtually any shape of specimen, from a small component such as a bolt to a large casting, to be inspected. Regulation of the magnetising current according to the section of work being handled is provided in the control unit, which is available for either a.c. or d.c. supplies or for universal use.



This the new Magco magnetic flaw detector which is portable

Electric Clutches and Brakes

NOW being made in this country by WESTOOL LTD., St. Helen's Auckland, Bishop Auckland, Co. Durham, are electric clutch-couplings and brakes designed by the American firm of Warner Electric Co. Both clutch and brake units are basically identical comprising a segmented plate type armature which mates with a segmented moulded friction surface behind which are located the windings. In the clutch, the connections to the windings are made through two slip rings fitted to its periphery, whilst in the brake, the windings are housed in the stationary part. Windings may be supplied for either a 6 V or 90 V energising supply. Engagement of the friction surfaces is smooth and positive, whilst the incorporation, of a rheostatic control in the energising circuit enables the speed of the operation to be varied to suit the drive.

New "Litesold" Accessories

IN our note in our issue 27 May 1954, about the "Litesold" soldering tool by LIGHT SOLDERING DEVELOPMENTS LTD, 106 George St, Croydon, Surrey, we mentioned the availability of a vertical type shield. These are made of Duralumin and normally have a red anodised finish. They can be mounted on the work bench or the wall to provide a suitable resting place for the Litesold tool to avoid the risk of accidental burns. They cost 5s. for use with $\frac{1}{8}$ in. bit soldering tools, 5s. 6d. for 3/16 in. and $\frac{1}{4}$ in. bit models and 6s. 6d. for use with a $\frac{3}{8}$ in. bit model.

Another useful accessory is the Heat Guard which slides over the iron and is fitted by pushing into the handle tube. Made of spring steel wire and chromium plated this accessory prevents damage to wiring and other heat sensitive components when working on miniature electronic and metering equipment. Prices are 4s. 6d. for the $\frac{1}{8}$ in. bit type, 4s. 9d. for the 3/16 and $\frac{1}{4}$ in. bit models and 5s. 0d. for the $\frac{3}{8}$ in. bit model.

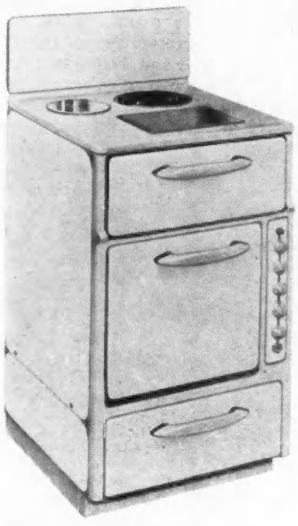
The B.N.E. C.90 Cooker

A new cooker the C.90 by BRITISH NATIONAL ELECTRICS LTD., Newarthill, Motherwell, Scotland, made its debut at the B.E.P.C. Exhibition at Eastbourne.

Most remarkable feature of this new cooker is its "Speedheat" oven which reaches 400° F in 12 minutes with a loading of $2\frac{1}{2}$ kW, a performance which is realised by the use of a new element design in which the ceramics have been reduced to an absolute minimum, coupled with a special high reflectivity pearl grey enamel and scientifically controlled air circulation.

Otherwise the C.90 inherits most of the features of the C.49. It returns to the counterbalanced drop-down oven door and embodies iron castings for the main frame and hob—an essential B.N.E. quality standard.

B.N.E.'s new C.90 is a "superspeed" cooker

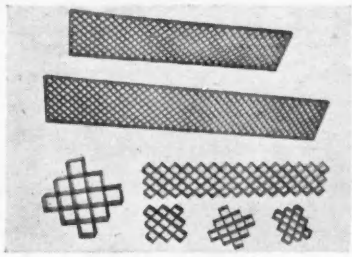


Colour scheme however is changed to two tone cream with hob door handles and switches in deep cream. Attention has been given to small details which really make it a luxury cooker—the hot cupboard door is counterbalanced on both sides and is fitted with rubber stops; a neat hinge which locks automatically holds the hob in the raised position and the plug in splash plate is firm and rigid. A special sliding hinge pin has been fitted in the hot cupboard door to enable the door to be partly removed for cleaning under the door, and as an additional eye catcher, Pyrex Ovenware firm have designed for B.N.E.'s exclusive use, a combined heat resisting glass casserole and grill pan.

Scemco plastic Louvreing

PLASTIC louvreing made up from multiples of a section $5\frac{1}{8}$ in. by $5\frac{1}{8}$ in. with squares $1\frac{1}{4}$ in. square by 1 in. deep and sealed by a chemical welding process, is latest introduction by SCEMCO LTD, 6 Soho St, W.1.

Advantages of this plastic louvreing are its lightness, its ease of handling and the fact that it does not tarnish nor warp and bend.



Scemco's Louvreing is built up from sections

There is no limiting factor in ceiling dimensions, the louvreing being cut to any shape to allow for pillars and odd-shaped corners. The firm emphasise that there is no extra charge for sealing the pieces together or cutting. Customers need only send actual measurements and quotations are despatched within 24 hours. Delivery is 14 days.

Panels for small installations are bound with the same plastic material but this is not necessary for large areas.

Safer Lighting in the Garage

THE Kelvin Norton overhead grid system for low voltage hand lamps has very much to commend its use in garages and other workshops where local lighting is required without the restriction of a rigid installation.

Major point in favour of the system which is handled by the KELVIN-NORTON ELECTRIC CO., LTD., London office, 3 St. Martin's Rd, Stockwell, S.W.9, is its safety factor using 12 V for the pressure of the local lighting system. This, as readers will know, employs an overhead grid system of twin copper wires which are fed with current at 12 V. A hook up assembly with strong clip type fastening conveys current by flexible lead to the inspection lamp. Again of the clip-on type, with a ball joint to give universal motion, a specially stout 24 W lamp is used, which can be dropped on hard floors an infinite number of times without damage.

Summing up these advantages, this system employs 12 V through a transformer giving a high safety factor, it avoids long lengths of trailing wires, and obviates frequent lamp replacement.

For the Electrical Trade

L.E.S. Lamps

IN a reference to Lilliput Edison Screw lamp bulbs by VITALITY BULBS LTD., Neville House, Neville Place, Wood Green, N.22, in our 27 May issue an error occurred in the text.

The 24 V and 28 V bulbs are available in 0·04 A and 0·06 A not 0·4 A and 0·6 A as stated.

Trade Publications

LIGHTING.—New catalogue sheets for lighting equipment loose leaf catalogue volumes 1 and 2 have been issued by British-Thomson Houston Co., Ltd., 18 Bedford Square, W.C.1. They deal with Mazda reflectors and floodlights for outdoor use. "Amber" sodium enclosed refractor lanterns for group "A" roads and "Seagull" type fluorescent fittings.

REFRIGERATORS.—Two new leaflets covering the Coldrator models D.S. 130 and D.S.180 service cabinets have been published by the International Refrigerator Co., Ltd., Fletton, Peterborough.

HOT WATER BOILERS.—"Tea please," a booklet published by James Stott and Co. (Engineers), Ltd., Oldham, Lancs, can be purchased by readers at 2s. 6d. per copy. It contains valuable information.

OIL PURIFICATION.—Sharples Centrifuges Ltd., of Tower Hse, Woodchester, Stroud, Glos, have published a report on methods for the continuous purification of oil in steam turbine lubricating oil systems.

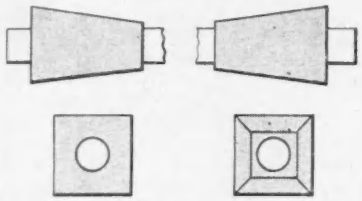
PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Adaptor for Drum Spindle

ALTHOUGH a majority of cable manufacturers now send out cable on drums with round spindle holes, a number still use drums with square holes. If a round drum bar is used in square holes rotation of the drum is jerky and on fairly heavy drums the jerk may be sufficient to throw the bar off the jacks with the likelihood of danger to the operatives, drum and cable. Furthermore jerky rotation of the drum may cause damage to the cable if a steady pull is maintained.



This adaptor for a cable drum having square spindle holes is easily constructed

The obvious answer is, of course, a bar of square section, but, whereas one circular section bar will suffice for a whole range of circular drum bar holes, it would be necessary to have a whole range of square section bars to fit in varying sizes of square section holes. To overcome this difficulty and thus keep the number of bars to a minimum, adaptors as shown in the accompanying sketch are a useful asset to cable gangs and in stores.

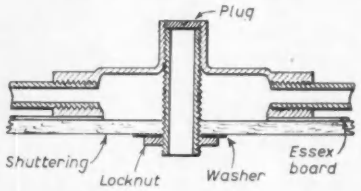
The adaptor consists of a pair of tapering square section wedges with holes in their longitudinal axes of a diameter to give a slight clearance over the diameter of the drum bar to be used. In practice a 2 in. diameter bar used in conjunction with wedges, say, 6 in. long and increasing from 2½ in. to 4 in. square section will cover most requirements for average size and weight drums.—*L. A. Budd.*

Isolating on Site

RECENT correspondence on the subject of isolating on site reminds me of a recent experience which illustrates its necessity. I had orders to install two 2 A socket-outlets in a new office. Fortunately, there was a 15 amp switched fuse already connected on site, from which I could supply the outlets. Being careful, I switched off a 30 A double pole switch and also pulled out a 60 A fuse feeding it at the main board. However, on connecting up the plug I was somewhat shaken by getting a shock from the neutral. I found that it was live to earth and upon tracing it back I found that when I had pulled out the 60 A fuse I had also made dead circuits elsewhere. A "clever amateur" had connected a lead between another fuse and the neutral in a vain attempt to restore the lighting supply. My experience just goes to prove the necessity for switching off on site rather than at a distant supply point serving not only to protect oneself but in order to minimise inconvenience to others.—*D. F. W.*

Fixing Conduit

ON 18 Mar. W. Satchwill described his methods of overcoming the problem of fixing conduit to wooden shuttering on which "Essex" board is laid prior to the pouring in of concrete. Often building labourers have scant respect for our conduiting and it is not an uncommon feature to see conduit boxes moved out of position, with disastrous results, by barrows full of concrete.



The use of a screwed back outlet conduit box is shown here for fixing conduit to shuttering

It is clear therefore that the boxes must be extremely well fixed. Driving nails through the back of the boxes is ingenious but introduces the danger of sharp edges being left after the nails are broken off which may easily damage the cables. My solution involves some slight co-operation with the building contractor to avoid placing obstructions at the ceiling outlet point positions and is shown in the accompanying sketch.

Screwed back-outlet boxes are required, the hole not used being filled by a standard plug. A short threaded piece of conduit or nipple is screwed into the box long enough to project through the "Essex" board; a washer is then threaded on the whole and is finally locked by screwing a backnut tightly. The locknut would have to be removed before the shuttering is struck, after which the nipple is unscrewed. It will be seen that the arrangement is simple and can be made up from standard fitments.—*M. N.*

Roller Bearings

MOTORS fitted with roller bearings may, if submitted to vibration, possibly during transit or in storage suffer damage due to fretting corrosion at the point of roller contact with the outer race. The typical cocoa coloured marks are a clear indication of fretting corrosion and are generally spaced the pitch of the rollers apart, the marking being at a maximum at the bottom of the race and less defined away from the bottom.

In most cases it is necessary for the damaged bearing to be replaced, but where the marking is only slight and as an expedient, it is possible to mount the outer race in its housing so as to bring the marks to the top centre, or in the case of a belt drive mount the outer race so that the marks are opposite the point of maximum roller pressure. This method will, in urgent cases, allow the motor to be put into temporary service until a replace bearing is available.—*"Torque."*

Checking the Speed

HAVING read with interest the correspondence on revolution counters, I would like to point out that many maintenance electricians probably have a form of revolution counter in their possession without being aware of its possibilities, in the ordinary cyclometer.

This can be removed from its bracket, a small adhesive patch applied to the five-star wheel, pressed against the end of the motor spindle and the registered revolutions checked over a minute with the second hand of a watch. It is, of course, necessary to know the number of revolutions on the cyclometer to produce a reading of 1. This is usually in the region of 16 and should be checked against a revolution counter when convenient.

The use of an adhesive patch is, of course, rather makeshift, and other methods can be adopted. The star wheel is usually held in place by a concave brass rivet and this provides a suitable spot for soldering on a brass spindle, over which a rubber head can be applied. The cyclometer is then rendered unusable for its original purpose in cases where the clearance between the star wheel and cycle spoke is inadequate. In many cases, however, there is clearance for a ¼ in. long spindle, leaving the cyclometer usable for a dual-purpose.—*W. Satchwill.*

NEWS OF THE WEEK

Research on Street Lighting Urged

Fine Art Commission wants Lower Posts but Same Efficiency

FOR the second time within a month an attack has been made on new street lighting installations, and particularly on the concrete column. Following the Council for the Preservation of Rural England's deprecation of the unsightliness of concrete posts, the Royal Fine Art Commission state that with the easing of the steel supply position it should seldom be necessary to use the heavier concrete columns. In the Commission's annual report for 1953, published this week, it is recorded that new street lighting installations are causing them great concern. The class A regulation height of 25 ft. is also the subject of criticism. In many cases the scale of buildings called for a reduction of that height, and the Commission urges that immediate technical research be carried out to enable the necessary standard of illumination to be maintained with shorter lamp posts.

The reports is kinder in its paragraphs on the design of power stations. It is acknowledged that further progress has been made in that field and mentions particularly the station at Willington. This is described as "a notable development . . . where most of the plant has been left exposed but carefully planned and detailed, to produce an effective group of structures."

Satisfaction is expressed at the Minister of Fuel and Power's rejection of the proposal to build a power station at Machen, Monmouthshire, but the opposite feeling is evident as regards South Denes where the Commission's persuasions failed. There appeared to be a tendency to believe, the report adds, that bad siting could be remedied by impressive elevations or elaborate brickwork. It would be unfortunate if such a view was generally accepted, the paragraph concludes. Power stations at Belvedere, Castle Donington, Drakelow, Greenwich, Marchwood, and Stella, were also considered by the Commission last year.

Trans-Canada Television

MICROWAVE radio relay equipment to carry television programmes in Canada between London and Windsor, Ontario, is to be provided by the General Electric Co. of England.

The order has been obtained by the Canadian General Electric Co., Ltd., the main contractor for the scheme, jointly from Canadian National Telegraphs and Canadian Pacific Telegraphs.

The link will employ similar equipment to that used on the Swiss Eurovision link supplied by the same company.

Chinese Trade Mission

TRADE experts from China arrived in this country on Monday for two-weeks' talks with representatives of industry and commerce. The programme for the visitors is being arranged by the Sino-British Trade Committee, a joint body set up by the Assoc. of British Chambers of Commerce, the China Association, the F.B.I., the London Chamber of Commerce and the N.U.M., the five organisations sponsoring the visit. The party's itinerary includes visits to factories, meetings with representatives of trade associations, and general talks on matters affecting trade between the two countries. The organising Committee emphasises that the sole aim of the talks will be to clear away existing hindrances and prepare the way for a substantial increase in the exchange of goods and services between the U.K., China and Hong Kong.

Strike of Maintenance Electricians Goes On

DESPITE efforts to reach a basis of settlement, the strike of maintenance electricians employed by J. Lyons and Co., Ltd, in the London area, is continuing. Last week officials of the Electrical Trades Union met the management of the firm, but the discussions resulted in deadlock. Apparently both sides agreed, at the meeting, to submitting the dispute to arbitration. But deadlock occurred when the company insisted that the non-union supervisor (over whom the dispute arose) should remain at work at Greenford and that the Arbitration Tribunal's terms of reference should be "that the company is free to transfer any supervisor to any establishment whether he is a member of a union or not." But the union disagreed on this, maintaining that the men had a right to say whether they would work with a particular supervisor or not.

The following day, electricians employed by a coachbuilding subsidiary concern were called out on strike by the E.T.U. At a mass meeting of the maintenance electricians employed by J. Lyons and Co., a resolution was passed by 375 votes to 56, permitting the executive of the Union to pursue the issue as they thought fit. Already the Union has circularised its members urging them to boycott the firm's products, and an extension of the strike to other establishments is threatened.

TESTING MINERS LAMPS

IN full operation now at Treorchy in South Wales is the N.C.B.'s new establishment for checking the quality of bulbs supplied for use in miners' lamps. Objects of the station are to accumulate basic information about all types of miners' lamps produced by various manufacturers, to establish routine testing, and to seek the co-operation of suppliers in achieving and maintaining a consistent quality. Decision was taken on the recommendation of the Board's Divisional Electrical Engineers' Conference, and the S. Western Divisional Board agreed to set up the station. The Board buys some 2½ million lamps a year.

British Exhibition in Copenhagen Next Year

AN all-British trade fair and exhibition is to be held in Copenhagen between 29 September and 16 October 1955. This was announced by Sir Norman Kipping, director-general of F.B.I., speaking at a luncheon in Copenhagen on Tuesday. It will be organised by the British Import Union of Denmark in collaboration with the F.B.I., and follows two most successful and similar British exhibitions held in 1932 and 1948, the latter attracting over a million visitors. The exhibition will be held in the city's Tivoli Gardens and Forum, but in addition to the trade displays, we understand that numerous British attractions will be staged coincidentally to attract even greater attention. It is interesting to note that the British Overseas Fairs Ltd, which was formed last year to run the Trade Fair at Baghdad, is lending its services for the Danish venture.

Space charges are expected to be on the same basis as in 1948. A prospectus is to be issued in September, but meanwhile enquiries from prospective exhibitors will be welcomed by British Overseas Fairs Ltd. at 21 Tothill St, London, S.W.1. In this time of growing competition it is hoped the British manufacturers will support the Fair to the fullest extent.

Debate on Brighton's Trolleys Postponed

WE must wait until September for Brighton town councillors' debate and decision on whether or not the town's trolleybuses should be scrapped. The Council met last Thursday and had before it a report of the Transport Committee recommending that the trolleybuses should be replaced by diesel buses, but it was agreed to hold a special meeting in September, when the whole matter would be discussed. The committee's chairman said he would read a memorandum at the meeting, giving the whole position of the transport undertaking and its history since 1925, but successfully fought suggestions that additional information should be provided before the meeting. Later he asked the Council not to spoil two years of negotiations and expert advice by trying to force the committee into giving information which could embarrass the whole situation.

OFFICIAL PUBLICATIONS

BRITISH STANDARDS. B.S.2479; 1954: Enamel (oleo-resinous) and silk or rayon covered round copper wire; B S.2480; 1954: Silk or rayon covered round copper wire.

OVERSEAS ECONOMIC SURVEY. South Africa. (See this page.) H.M.S.O. 4s. 6d.

AFRICAN NATIVE MARKET in Rhodesia and Nyasaland. (See this page.) H.M.S O. 1s. 6d.

ROYAL FINE ART COMMISSION. Annual report for 1953. (See page 25.) H.M.S.O. 1s. 3d.

AEMT ANNUAL MEETING

NINTH annual meeting and luncheon of the Association of Electrical Machinery Trades took place in London last week. The retiring chairman, Mr G. W. Smith in his report on the previous year appeared completely satisfied with the successes gained and achievements. He referred to the Association's membership of the B.S.I., and the record support at the annual ball and convention. The Association's annual ball will be held this year at the Savoy Hotel, on 19 November, and the new chairman asked for members' full support. Venue for the 1955 Convention will be decided by the Council. Election of officers for the ensuing year is referred to on page 18.

Expansion of S. African Electrical Industry

THE Union of South Africa has been running neck and neck with the U.S.A. as the second most important market for U.K. goods, states the Overseas Economic Survey for the Union published last week. With this in mind, electrical manufacturers cannot afford to ignore the market, although they cannot expect an easy time. The Union's own electrical engineering industry has expanded a great deal in recent years, stimulated by increasing local requirements in mines, power stations and industry in general. The range of products being made out there is a formidable one, including motors, generators, alternators, transformers, switchgear, wire and cables, and control gear. In the domestic appliance field, the picture is very similar.

Imports of the above items have, of course, diminished as local production has risen. Heavy equipment such as dynamos, generators and electric motors, make up one half of the £9 millions of electrical imports and the U.K. has always dominated the market. There is now probably over-production capacity in the Union for most types of cables and wires and plans are in hand to produce h.t. aluminium steel-cored cables for power transmission and telephone cables. Thus the Union herself may well be Britain's main competitor, coupled with the now familiar names of America, Germany and Japan.

Nevertheless, if the above should appear disheartening, the report mentions two items to stimulate interest. The first is the Electricity Supply Board's programme of new power stations and extensions. This is likely to extend over a number of years and involves capital expenditure of about 91 millions. The second fact is that demand for electricity exceeds the supply and a balance is unlikely to be struck for some time.

On the general subject of trade, the report emphasises the need for a greater sense of urgency. It is stated that business has been lost by the U.K. because of unsuitable qualities and unsuitable prices, but most damage has been done by unsatisfactory deliveries. These are now familiar reservations applicable to most markets, but are unfortunately true and important.

Minister asked to discuss Highland Plan

ANOTHER request for a meeting with the Minister of State, Scottish Office, to discuss their plan for a special authority to tackle the Highland problem, has been made by the Local Authorities' Hydro-Electric General Committee. The plan was submitted about a year ago but the Minister did not consider it worthwhile discussing the matter while it was being examined by the Royal Commission on Scottish Affairs and the Crofting Commission. In the meantime several important developments have taken place in the Highlands but depopulation continued. The plan includes a suggestion that the special authority should have executive powers, and should be endowed with funds by the Government to support approved schemes of Highland development. It is considered impossible for the hydro-electric schemes to check the drift of population on their own.

Electricity stands at recent Agricultural Shows at Chatteris and Dumfries. The Cambridgeshire County Show (above) was held in most inclement weather, but attendance was nevertheless encouraging. In much better weather the Duke and Duchess of Gloucester paid a visit to the Royal Highland and Agricultural Society's Show at Dumfries

African analysed as a Consumer

A REPORT on the Central African native as a consumer has recently been completed by the U.K. Trade Commissioner at Salisbury, and has been issued by the Board of Trade. The booklet contains detailed information on the African population, employment, earning power, and his habits as a buyer, all important items of information in assessing his value as a potential customer. It is a general survey and does not devote much space to individual commodities or the possibilites of marketing them, but it should provide much useful background knowledge, and helpful advice. Its title is "The African Native Market in the Federation of Rhodesia and Nyasaland."

An American View on Atomic Power

IN A report from Washington, Mr Robert Le Baron, chairman of the Military Liaison Committee of the Atomic Energy Commission, predicts that atomic power will have replaced nearly all the fossilised fuels for steam generating plant in about 50 years' time. He admitted that water power would still be used because of its cheapness, but it would be difficult to find a steam generating plant using coal or oil as its fuel. If present efforts were doubled, he went on, there would be a large number of atomic plants generating electricity within five years instead of the ten usually forecast. Fifty U.S. companies were now working on the problem.

A game in progress on a floodlit tennis court at Paddington Bowling and Sports Club. How long will it be before we have floodlit tennis at Wimbledon?

FLOODLIT TENNIS COMES TO PADDINGTON

TOPICAL subject this week is the floodlighting of tennis courts, and we note a most satisfactory installation carried out at Paddington Bowling and Sports Club. It is only recently that tennis organisations in this country have paid a lot of attention to floodlit tennis, although it is well established in other parts of the world, notably in America and Australia. In Sydney, it is said that there are over 1,200 illuminated courts. Does this explain the superiority of those countries in the sport at present?

However, the new lighting at Paddington is exemplary and provides conditions little removed from daylight. Designed by the British Thomson-Houston Co's lighting engineers, the installation comprises ten Mazda "9"projectors housing 1,000 W GLS lamps. The fittings were specially designed to throw light evenly over a controlled area. Slight overlapping of projection has produced an even distribution over the whole court. There is spill light at the centre to a height of 24 ft, and the "cut-off" of the fittings is such as to allow only a fraction of the lamp filament to be visible. Those two factors safely deal with the problems of players when dealing with lobs and when serving. The ten lamp fittings have been mounted on steel poles along each side of the court at 23 ft centres and at a height of 20 ft.

Electrical contractors were R. J. Stearne of Luton.

Efficient Welders Star in Prestige Film

AIMED at maintaining prestige rather than selling products, a new film has been produced by Babcock and Wilcox Ltd. called "Craftsmen Welders." The film will be shown to clients, engineers, insurance organisations and similar bodies, and should fulfil its object of building up the company's reputation. In the course of 23 minutes the audience is shown the extreme care which Babcock take in the training of their welders. Although a careful check can be kept on the goods made in their factories, the same cannot be done on the finished article, much of which is assembled on site. Heavy responsibility therefore rests with the welders and thus the story of how they train those men to the highest possible standard of efficiency will be a useful means of instilling into prospective customers a high degree of trust. The treatment of a very difficult subject, from the point of view of photography, was particularly impressive. "Craftsmen Welders" was made by Technical and Scientific Films Ltd., in association with the Film Producers Guild.

Submarine Cables Lunch

THE problems involved in the manufacture and laying of the new Atlantic telephone cable was the appropriate subject of the Postmaster-General's speech at the annual luncheon party of Submarine Cables Ltd. Earl De La Warr was the guest of honour at the luncheon, and was proposing the toast of the company, which is owned jointly by Siemens Bros. and Co., Ltd., and The Telegraph Construction and Maintenance Co., Ltd. Submarine Cables have undertaken a major part of the project and are fitting out a new factory at Erith for the purpose.

Natural Gas to offset Atomic Electricity

NATURAL gas was found last week in Ashdown Forest. Prospecting is being carried out by the exploration subsidiary of the Anglo-Iranian Oil Co. for the Gas Council, who, six months ago, embarked on a five-year programme embracing the whole of the British Isles. The work is expected to cost a total of £1 million. It is too early yet to determine whether the gas exists in commercial quantities, but the Gas Council is hoping that one or other of their drills will be fruitful.

Main purpose of this extensive search is to meet the competition of atomic electricity and to save the gas industry's dependence on carbonising coals which are ever vulnerable to rising prices. Recent coal price increases will present the gas industry with an extra annual expenditure of £30 millions. The industry does not believe that electricity generated by atomic means will be cheaper than at present, but if natural gas is discovered in sufficient quantities, the price of gas will be less than it is now, and the industry will not be influenced by coal prices.

The First Half-Century

A great deal is heard in these days of high-tension transmission of power, but the examples are chiefly taken from the continents of Europe and America, and the transmission is usually by bare overhead wire. It is therefore of interest to know that in connection with the approaching service of electric cars in Tottenham, Wood Green and Edmonton district the power will be distributed at 11,000 V from the station at Brimsdown, Enfield. The duplicate system of high-tension mains conveying the power, is laid underground, and the cables have been tested up to 20,000 V. The supply will be transformed at substations in the tramway area to continuous-current at 500 V. I believe this is the first instance of such high-pressure transmission in England for tramway, as distinct from railway, working.—*From our issue of* 30 *June*, 1904.

Photographed on a recent outing to the Lake District are members of the Ashton-under-Lyne section of the E.C.A. Oldham branch. In the course of their trip, with chairman Mr H. Haugthon, of J. W. Marland, they visited the Ulverston factory of Ashley Accessories Ltd

English Firm builds Factory in Australia

A NEW factory for the assembly and distribution of English-made goods was opened recently at Meadowbank, situated on the Parramatta River, near Sydney, Australia. This enterprise is to be attributed to Hoover Ltd., whose director, Mr P. Attwood, has been in Australia for some months now supervising the work on the new factory. It is intended that the Mark II washing machine should be assembled on the premises, which extends over some 54,000 sq ft. Also moving to the new building will be the staff of Hoover (Australia) Pty. Ltd., the British firm's associated company out there dealing with sales and administration. The Meadowbank works, which will make the appliances from both English and locally-made components will not only greatly aid the expansion of washing machine sales but will also allow increased imports of other items, such as cleaners, polishers and f.h.p. motors.

This development is of greater interest because it admirably supports the advice given by an Australian industrial adviser in this country and reported in our issue of 22 Apr. For large concerns, it was stated, the answer lay in taking production facilities to Australia. There was ample scope to set up factories and businesses out there and begin to compete on the same footing as Australians.

Annual Fuel and Power Statistics

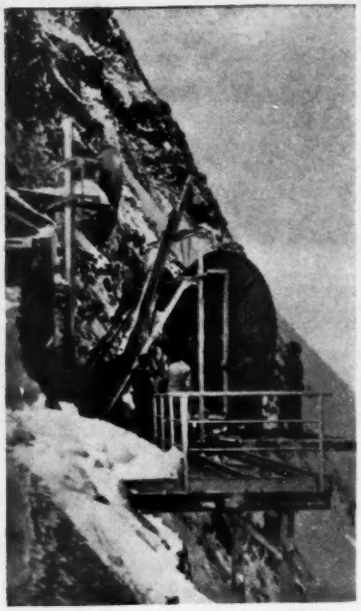
STATISTICAL information of the operation of the supply industry in Great Britain is given in the Annual Digest of Statistics published last week by the Ministry of Fuel and Power. It includes the results of the Steam and Power Survey details of which were given in last week's issue.

Tables giving details of stations, evaporative capacity of boilers, installed capacity and similar details show that, in 1924, 494 stations shared a totalled installed capacity of 3,724 MW, that of a.c. plant being 3,343 MW and that of d.c. plant, 381 MW. By the end of 1952, 339 stations shared 17,823 MW apportioned out to a.c. and d.c. plant by 17,661 MW and 162 MW respectively. Load factor has varied from 29·9% in 1924, to about 45·6% in 1950 and 43·2% in 1952, based on units generated, whilst the ratio of units generated to kilowatts installed rose from 1,617 in 1924 to 3,672 in 1951, falling again to 3,427 in 1953.

An interesting picture of maximum output and available capacities and load shed is given, showing that the period from July to December last year was the first since 1947 in which no load shedding took place. During the last two months of 1953 the maximum available capacity was 14,729 MW, and the maximum demand 14,505 MW. In the corresponding period of 1951, these figures were 12,352 MW and 13,543 MW respectively.

Training Engineers

ANOTHER brochure has been added to the library of publications explaining facilities offered by various firms for the training of electrical engineers. The latest is issued by Metropolitan-Vickers Electrical and aims to inform final year engineering students of universities and senior technical colleges both at home and overseas of the opportunities provided by the company for post-graduate training. It is entitled "The Training of the Professional Engineer." Incidentally, the Metrovick training scheme was initiated in 1902, and the number of graduates trained now totals over 3,000.

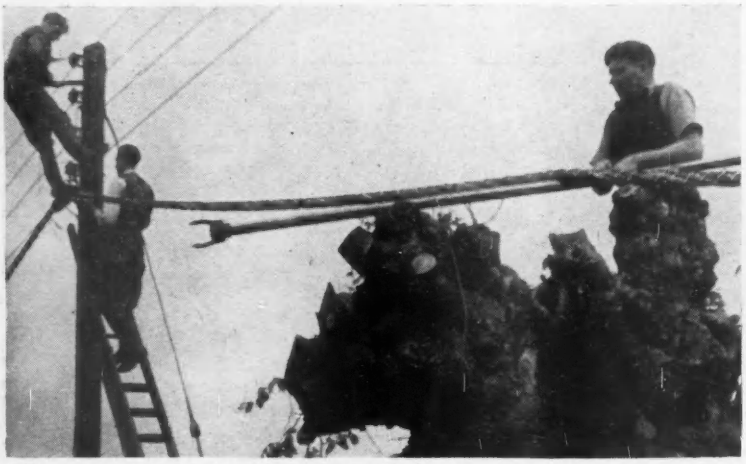


The recent television link-up across Europe involved a radio relay link over the Alps. The route, 125 miles in length, connected the German and Italian networks from Chasseral to Lusute Generoso via a relay station on the 15,000 ft Jungfrau, and our photograph shows the aerials at this station being erected. All equipment was supplied by the Coventry telephone works of the General Electric Co., the order being placed on behalf of the Swiss Post, Telegraph and Telephone Administration by the Swiss firm Hasler S.A. who installed the equipment jointly with the G.E.C. The link provides a one-way reversible television channel, whose bandwidth, extending to 5·5 Mc/s, is thus suitable for 625 line pictures

Speeding-up Power Supplies in Somerset

IN VIEW of the S. Western Electricity Board's extensive five-year programme of rural electrification involving some 29,000 farms and other premises, engineers in the area are experimenting with new ways to quicken work and reduce costs. One such experiment which proved successful was carried out at Backwell Hill, North Somerset, where additional supplies was taken to a Post Office research station and an orphanage at the top of the hill, where there was also a farm and many cottages which were then without electricity.

This necessitated the extension of an 11,000 V main to the hill top and the Board's engineers erected the high voltage line on poles carrying an existing low tension circuit. In order to use the existing poles a new type of rubber-insulated aerial cable was made by British Insulated Callender's Cables Ltd. The 1,300 yds of cable was run out by winch, attached to a wire hawser and pulled through pulley blocks, and finally mounted on the poles spanning the wooded hillside. It is claimed as a pioneer experiment, but whether this is so or not it is an excellent method of keeping down costs. It will also enable engineers, with a major repair job on hand, to provide an alternative supply quickly and cheaply.



S. Western Board engineers clear high voltage cable from tree stumps while erecting it on poles carrying low tension supplies to the top of Backwell Hill in Somerset

Garage Doors which can be opened from the Road

GARAGE doors, electrically operated by remote control at the house of a Torquay engineer have attracted considerable attention. The device invented by the engineer some time ago comprises a simple unit mounted in the garage at the height of the door lintol and coupled to the doors by connecting rods. This unit has a reversing screw mechanism driven by a 1½ h.p. motor through a V-belt. Conversion of the rotating movement of the drive screw to the required reciprocating action has been achieved by means of a travelling block running on the screw. Two arms are attached to the block and in turn are coupled to the connecting rods. The motor circuit is controlled by one or more remote switches, situated in any convenient position, and a two-way limit switch which breaks the circuit at either end of the travel. A further switch operated concurrently with the limit switch, reverses the connections to the starting windings of the motor ready for the next operation.

Switches are of the micro-gap type, and are, in fact, installed in positions on gateposts and wall where the driver can reach them without getting out of his car.

The engineer is Mr G. A. Allwood, M.I.H.V.E., who informed us last week that a West Country firm had approached him regarding the granting of a licence to manufacture under patent, and they hoped to conclude arrangements shortly.

B.E.P.C. EXHIBITION

ON page 863 (10 June issue) in our description of products shown by Monsanto Chemicals Ltd. at the above event, the second sentence, referring to "Pyroclor" transformer coolant, should have read, "Apart from the advantage conferred by its non-inflammability . . ." and not as given.

NEWS IN BRIEF

A further installation of City of London lanterns, devised and produced by Siemens Electric Lamps and Supplies Ltd., for street lighting in London, is to be carried out between Holborn Circus and Cornhill. Fifty-nine of the fittings will be mounted vertically on building faces and about 12 pairs back to back on existing columns.

With the help of electricity over a million eggs a week can be handled with ease at the Somerset Poultry Marketing Association's establishment near Bridgwater.

Bakelite Ltd. announce that an exhibition of Bakelite, Warerite and Vybak plastics will be held at the Institute for the Blind, Newport Rd, Cardiff, between 6 and 10 July.

Contract has been received by Fraser and Chalmers Engineering Works from the Anglo-American Corporation of S. Africa to supply mechanical parts for a 10 ft diameter double drum winder for Vaal Reefs Exploration and Mining Co. Ltd.

The 1954 edition of the Directory of Members has been published by the Aluminium Development Association.

Thirteen telecommunications specialists from ten countries are to attend a two-weeks' course designed to show how point-to-point radio circuits for internal and overseas communications of U.K. are planned, equipped and organised. It is organised by the British Council and G.P.O. Engineering Dept.

Royal Opening

THE Scottish Industries Exhibition, to be held at the Kelvin Hall, Glasgow, will be officially opened by H.M. Queen Elizabeth, the Queen Mother, on 2 September. By happy coincidence it will be five years almost to the day since Her Majesty opened the 1949 show. The exhibition will be open until 18 September and arrangements are now nearing completion.

QUESTIONS IN PARLIAMENT

Channel Cable

ANSWERING questions on the cross-channel cable project Mr G. Lloyd said cable laying trials were conducted off the English coast last summer and the corresponding sea trials by the French were now in progress at Boulogne. Asked about the possibility of building a tunnel for road and rail traffic and power cables to provide a closer link with Western Europe as well as reducing costs of generating power by Mr B. Jannet, ,the Minister said the B.E.A.'s proposal agreed with Electricite de France had been received and he thought they ought to press on with this practical scheme.

Import of Radio Valves

MARKINGS of radio valves sold in this country occupied some considerable time during Questions last week. Mr Hobson raised tre point that foreign valves were imported clearly marked "Foreign Made" but bearing the stamp of a prominent British manufacturer and the stamp of the British Valve Manufacturers' Association. Mr H. Strauss explained that the Merchandise Marks Act required that imported goods should bear the country of origin and the marking described by Mr Hobson had been ruled as sufficient to comply with that requirement.

Concerning the number of licences granted, Mr Strauss said the import of radio valves from Western Europe and certain other countries was under open general licence, but otherwise 37 licences had been granted between October last year and 1 June. He added that licences were granted if alternatives were not available in the U.K. or other non-dollar countries, or if required for export trade. Imports of radio valves were not separately recorded, but 2,078,000 electronic valves were imported into the country in the first quarter of 1954 and 771,000 in the same period last year.

Tax on Villages

RURAL electricity schemes in Wales was the subject of an Adjournment debate last Friday. Mr Tudor Watkins criticised the S. Wales Electricity Board's practice of charging capital contributions for the provision of mains and services, introduced in the autumn of 1952, and described it as a tax on villages. He maintained that the Board's policy had changed the attitude of rural dwellers towards electricity, and asked that it be reviewed. Mr Watkins also pointed out that it was difficult to understand why some villages were asked to pay capital contributions and others were not. He said he was not against the principle of those charges but did not like the "taxing of villages"; maintaining that it would be the small chapels, churches, village halls and schools who receive no income tax relief or grants from the Ministry of Agriculture which would have to pay. Nevertheless, Mr Watkins praised the Board for progress already made.

Mr L. W. Joynson-Hicks, in his reply, regretted the use of the word "tax" because all that was happening was that the Board were recouping the cost of what they were supplying. The greater the revenue received, the less was the contribution towards cost required. He explained that the Board did not charge for h.t. cables or main transformers: they were paid for in the normal course of economic activities. They did, however, charge for erecting h.t. cables, poles, etc. He also pointed out that all Boards offered at least one alternative. Mr Joynson-Hicks reminded the House that the various Boards were required by the Act to standardise methods of charging, and that was the reason for the 1952 alteration. He regretted the fact that Mr. Watkins had forgotten the Area's Consultative Council whose task it was to deal with such queries.

Fuel Saving Appliances

ANSWERING Mr M. MacPherson, the Minister of Fuel said that about 1½ million improved solid fuel burning appliances recommended by his Department, had been delivered to the home market last year.

Fuel Advisory Service

TRANSFER of the Ministry's fuel efficiency service to the new Fuel Advisory Co. was now complete, Mr Geoffrey Lloyd informed Mr A. Palmer. An officer of the Department had been appointed as an observer and both administrative and technical levels were in close touch. Later, the Minister said that since the new service was formed, there had been an increase in the number of enquiries from industry. He also said the House would be kept informed of progress.

ELECTRIC SUPPLY NEWS

Bexhill

Work has started on standardising the voltage of supply in Bexhill by the South Eastern Electricity Board. At the moment both a.c. and d.c. is in use. The task of change-over is expected to take two years.

Douglas (I.O.M.)

During a discussion on matters concerning the corporation's electricity undertaking, arising from the increased wage award to manual workers, Councillor T. Radcliffe, chairman of the Electricity Committee, said that the rise in the cost of fuel, freight and other costs had not been fully allowed for in the estimates, which were framed to come out level. If consumers used 25% more electricity than at present, it would cover the undertaking and prevent further tariff increases. Another member suggested that it was time the undertaking got down to some business methods of selling electricity, and said that if it was cheaper people would consume more. But Councillor Radcliffe maintained that the cost of heating and power for boarding houses was cheaper now than before the war. The tariff was made low to get people to use more electricity, but they were not using enough.

Hebburn-on-Tyne

The North-Eastern Electricity Board are to lay a 22 kV cable and low voltage underground cable to reinforce the network in School St and Victoria Rd. Plans have also been approved for a substation in connection with a proposed supply of electricity to houses in East St, etc.

Llanelly

Complaints about alleged fumes from the local power station were discussed at a meeting of the Borough Health Committee. Stating that he could confirm the residents' complaints, Councillor Williams said that one day a sulphurous atmosphere which caused intense coughing stretched over an area extending from Queen Victoria Rd. to the General Post Office in the Town Hall Square. The medical officer, Dr B. Hopkins, said that on the day in question coal having a high sulphur content was being tested. It was not normally used, and he had been given an assurance that the trouble would not recur.

The committee decided to ask for the assurance to be given in writing.

Minehead

Progress being made in the £25,000 project to extend a 33 kV transmission line into Minehead and provide a new bulk supply point, was inspected last Thursday by Mr S. F. Steward, chairman of the Board, when he was accompanied by Mr A. H. Short, the district manager, and Mr F. H. Crocombe, the district engineer. The demand for power in the Minehead district has nearly trebled since 1948. Until the present scheme, electricity has been transmitted from the main substation at Bowhays Cross, Williton, by two 11 kV o.h. lines. These were connected by underground 11 kV cable around Minehead, forming a complete ring. The new 33 kV line has been extended beyond Bowhays Cross direct to Minehead, terminating at the generating station site there. The work is expected to be completed early next month.

N. Ireland

An appeal by the Electricity Board for Northern Ireland against the refusal of the Antrim County Council to allow two o.h. cables to be erected at Warren Glenariffe, was heard at Stormont recently by the Ministry of Health and Local Government. The proposed line would involve the erection of five poles which would be silhouetted against the sky and might affect the scenic amenities. Mr J. M'A. Irons, area manager of the Board, considered the poles would not affect amenities as far as the view was concerned.

Nottinghamshire

The proposed new power station to be established by the B.E.A. at High Marnham, Notts, where it is hoped to install a 200 MW generating set, to which Lord Citrine made reference at the B.E.P. Convention (ELECTRICAL TIMES, 17 June issue), will probably have five such machines installed, it is revealed. The first set is scheduled for operation in 1959. At last week's meeting of the Retford Rural Council, the clerk, Mr R. L. Gay, said another power station was planned to be erected at West Burton.

Sayings OF THE WEEK

"The two most common defects in artificial lighting are direct glare from badly-shaded sources and insufficient illumination of outside yards and roadways. In addition, passages and staircases in older premises are often so dark as to be really dangerous . . ." THE CHIEF INSPECTOR OF FACTORIES, in his annual report.

"Where articles which he understands are concerned, the African is a more exacting purchaser than the European. The days when any old rubbish could be foisted on the African are well behind . . ." from the report on the African Native Market.

"The dangers to the trade in Britain do not alone come from other countries. The continually rising costs within our own country are slowly closing available export markets one by one. . ." SIR ANDREW MCCANCE.

Ross-shire

The first 12,000 kW generator at the Luichart power station of the North of Scotland Hydro-Electric Board had its initial test run last week—it was started by Sir Hugh Mackenzie, deputy chairman of the Board. A second set, of the same capacity, is nearing completion. The Luichart power station is one of four power stations in the Board's Glascarnoch-Luichart-Torr Achilty scheme, the main development of the hydro-electric resources of the River Conon valley which will have a total capacity of about 65 MW and an output of about 290 million units annually. The Aschanalt, Glascarnoch, and Torr Achilty projects are also at an advanced stage of construction. Ultimately there will be six generating stations in the Conon basin group, with an installed capacity of 107,000 kW and an estimated annual output of about 442,000,000 units. The first stage in the development of the valley was the Fannich scheme, which has been in operation since 1950. The scheme relating to the sixth station and associated works, the Orrin project, was passed by Parliament on 2 June, 1954. The control point for the group is to be established at Contin.

Suffolk

There was a tremendous back-log of rural electrification in East Suffolk, Mr P. Sydney, Suffolk sub-area manager of the Eastern Electricity Board, told the local Parish Councils' Association at their annual meeting last week. The Suffolk sub-area was 2,000 square miles in extent and the year before last 4,800 consumers were connected. Last year 7,000 consumers were given a supply. The figures for farms were 211 and 349 respectively. The Board had started on its second five-year programme, and within that time it was expected that the greater number of people in the rural areas and seven out of ten existing farms would be connected, he added.

Lighting Schemes

Bognor Regis. The U.D.C. propose to install fluorescent lamps along two gaslit roads at a cost of £4,677.

Buxton. M.o.T. are to approve the conversion of further street lighting from gas to electricity. A further section of the A 6 road is suggested. The Ministry have also indicated that approval will be given for the whole of phase two of the Council's conversion scheme. This covers many streets in a wide area of the town.

Dunfermline. The council has approved a five-year plan for improving street lighting estimated to cost £3,520 per annum.

Penrith. The Council has approved a Highways Committee recommendation that the scheme for lighting the trunk road with fluorescent lighting be proceeded with, although some of the cost would not rank for Ministry grant. The Council agreed that lamps in Duke St and Market Sq, which would not qualify for a grant, should be included in the scheme.

COMPANY ACTIVITIES

WITH more finance available after the strictures of the early post-war years, the board of Telephone Rentals Ltd. is broadening out its business. Liquid funds are sufficient. But for overseas commitments and a reasonable working capital £240,000 is to be raised by a one-in-ten Ordinary share issue at 7s. 6d. per 5s. share. Following successes in S. Africa, it is intended to open up in Toronto and later in other parts of Canada.

Mr. Fred T. Jackson, the chairman, also records the acquisition of a half interest in an Australian business which has quite a substantial rental revenue. It is a repurchase of a business started by the company but sold to Australian industrialists at the outbreak of war. This is the kind of overseas enterprise which is common in our trade.

Ferranti is spending $2·5 millions in Canada, through the agency of a subsidiary. English Electric, in a different kind of operation, is lending the Greek Athens-Piraeus Electricity Co. £7 millions in the form of actual equipment, while Sir George Nelson, the chairman, has just finished a 19,000-mile S. American trip. These activities indicate the determination with which British undertakings are endeavouring to consolidate their post-war gains in overseas markets now that competition prevails with a capital "C."

After a poor time in the post-war reconstruction years the management of Engineering and Lighting Equipment Co. (chairman, Earl of Verulam) has turned out a winner. Net profit for the year to Mar. 31 last was £84,912, which is five times greater than the 1950 figure. Dividend is 30% against nil. At one time it looked as if the redemption of the 64,844 Preference shares at 25s. out of current resources in 1954 might have proved impossible. But, state the board now, the operation will be carried out in August "with little hurt to our present liquid position." The Company makes lighting equipment for streets, industry and ships, together with electrical, mechanical, engineering and plastic products. Order book is full, with sufficient work to give 100% operation at least for the current financial year.—*From our City Correspondent.*

Drake and Gorham Ltd.

The dividend for the year to 31 Mar. last is increased by 2½% to 7%. Consolidated net profit for the year amounts to £28,468, compared with £9,725 a year earlier.

Electric Construction Co. Ltd.

For the year ended 31 Mar. last the net profit is £110,526 against £93,503 for the previous year. The dividend is again 15%.

Engineering and Lighting Equip. Co.

The remarkable expansion of this concern over the past five years is clearly indicated in our accompanying table. To some extent this is due to the diversification of the scope of production, ranging from control panels, lighting fittings and a variety of electrical and mechanical equipment to plastic mouldings and

Year to Mar. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	33,743	17,222	27	—	1/7	1/1
1951	89,847	30,302	53	5	3/–	1/3
1952	102,066	33,616	59	10	2/4	1/6
1953	138,330	41,285	71	15	3/1	1/10
1954	238,163	84,912	150	30	5/2	3/–

Perspex fabrications. Manufacturing capacity in certain specialised directions is being extended, notably in the field of light alloy castings and plastic manipulation. The Earl of Verulam, chairman, also refers to the order book as being satisfactory, while for the first time for many years there is a credit balance at the bank of £76,937 against an overdraft last year of £31,211.

Ferranti Ltd.

With the profit for the nine months ending 31 Mar. last above that of the previous twelve months, it is obvious that Sir Vincent de Ferranti, chairman and managing director has another success story to tell. Output of the group for the period just ended rose by 14%, yet unexecuted orders still amount to £15 millions. While the output of power transformers increased by 32% in value over the figure for the corresponding period of 1952-53, and distribution transformer business rose by some 25%, the total sales input for transformers of all types has dropped. Sales of electricity meters have recovered in many overseas

Year to June 30	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	718,969	248,100	77	6	—	—
1951	1,427,467	540,129	192	6	—	—
1952	1,531,832	529,208	188	6	—	—
1953	1,575,319	436,248	72	6†	—	—
1954*	1,673,467	546,863	92	6	—	—

*For 9 months to 31 Mar. †Plus 200% capital bonus

countries, but in the home market there has been a slight fall, although there was a 55% increase in rate of sales input of all types of meters, Sir Vincent states. Several new special purpose machines for producing the FM meter are now in operation. Output of radiant fires has also been trebled. In Scotland, the output of the factories is rising, while the Canadian company is extending its range of transformers and making improvements in design to combat competition. In regard to our table above, it should be explained that all the £1 million ordinary stock units of 10/- each are privately held.

Hackbridge and Hewittic Electric Co. Ltd.

This concern also is increasing its dividend. There is a final of 20%, instead of 15% before, making a total of 25% for the year ended 31 Mar. last. Consolidated trading profit for the period is £504,225, compared with £460,853 a year ago. After all charges the net profit amounts to £167,767 (*£154,158*).

Marryat and Scott Holdings Ltd.

The dividend for the year ended 31 Mar. last is raised by 2½% to 25%. The net profit for the period is £60,983 (*£45,363*).

Morgan Crucible Co. Ltd.

A final Ordinary dividend of 10½% raises the total distribution for the year ended 31 Mar. last by 1½% to 14%. The net profit for the period is £677,180 (*£707,646*).

Permali Ltd.

The group trading profit for the year ended 31 Mar. last is £72,434, after charging depreciation, compared with £83,042 for the previous year. The final dividend is 7%, making a total of 11% on the increased and reconstructed capital. That dividend and the profit are in accordance with the forecast given by the directors at the time of the placing of 2½ million shares of 2s. each on the London Stock Exchange last February.

Pye Ltd.

Treasury consent has been obtained to raise £700,000 by an issue of 5s. "A" Deferred Ordinary shares. These will be offered on a rights basis to Deferred Ordinary and "A" Deferred Ordinary shares. The proceeds will defray the cost of redeeming the £500,000 4½% Unsecured Notes, the cost of erecting new buildings estimated at £100,000, and providing further working capital.

Venner Ltd.

With increased availability of raw materials, output during 1953 was again raised, and is reflected in the higher net profit for the year. The building extensions completed in 1953 are fully occupied with high precision work and there is every indication that this is likely to

Year to Dec. 31	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	54,878	11,310	8	5	7/6	3/3
1950	79,499	24,043	20	12½	9/3	4/6
1951	105,621	25,825	22	15	10/3	7/–
1952	110,344	22,702	17	15	8/6	5/6
1953	134,583	27,374	20	15	9/3	7/1

continue for a considerable period, Mr A. S. Rowse, the chairman, states. Since the close of the last financial year, the value of orders received and of deliveries made continues to show a considerable expansion. Parking meters are now coming into production at the factory, and good progress has been made in the electronics sphere.

Dividends Declared

International Combustion Africa. Interim of 15% (*10%*).

Marco Refrigerators Ltd. Interim of 2½% (*nil*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

2 July—Aberdeenshire. Installation in police station and houses at Turriff.—See 17 June issue.

2 July—Manchester T.C. Installation in 27 houses. Advertised in 24 June issue.

2 July—Stourbridge T.C. Installation of 242 units of class A street lighting—See 24 June issue.

3 July—Aberdare U.D.C. Street lighting equipment to replace existing equipment. —Advertised in 3 June issue.

3 July—Gloucester T.C. Installation in St. Oswald's Rd Cattle Market.—Advertised in 24 June issue.

3 July — Halifax T.C. Installation at Haugh Shaw school.—See June 24 issue.

3 July—Mountain Ash (Glam) U.D.C. 9¼ miles group A street lighting on main roads.—See 3 June issue.

5 July—Angus. Pole brackets with cable, etc., for street lighting at Tealing.—See 17 June issue.

5 July—Antrim R.D.C. Rotary distributor pump and ejector, etc., for sewage works at Killead.—See 17 June issue.

5 July—Co. Down. Installation in block of 1 shop, 1 house and 5 flats at Comber. —See 24 June issue.

5 July—Horncastle (Lincs) R.D.C. Installation in houses in four districts.—See 24 June issue.

5 July—Manchester T.C. Installation in residential nursery, Wythenshawe.—Advertised in 10 June issue.

5 July—Newton Abbot R.D.C. Maintenance of wirings, fittings, etc., in council houses.—See 24 June issue.

5 and 19 July — Southend-on-Sea T.C. Installation in Bournemouth Park schools and West Leigh school.—Advertised in 24 June issue.

5 July—West Riding. Rewiring at Morley Elmfield school.—See 24 June issue.

5 July—Wombwell U.D.C. Wiring of 265 houses and bungalows on several sites.—See 24 June issue.

6 July—Kirkcaldy T.C. Installation in clinic and creche at Templehall Neighbourhood Unit.—See 24 June issue.

7 July—Bridgwater T.C. Supply and erection of 50 concrete columns (25 ft) with lanterns, control gear, etc., for 140 sodium discharge lamps. Borough Engineer, Town Hall. Deposit £2. 2s.

7 July — Derby T.C. Installation in 132 dwellings at Mackworth and 104 houses in Harvey Rd.—See 24 June issue.

7 July — Wandsworth B.C. Supply of sodium lamps and jackets. Also, group B street lighting. — Advertised in 24 June issue.

8 July—Cardiff T.C. Underground cables for trolleybus extension.—Advertised in 24 June issue.

8 July — Northwich (Ches) RDC. Street lighting schemes for Manchester Rd, Lostock Graham, Forest Rd, and High St, Tarporley.—See 24 June issue.

9 July—N. Ireland. Electrical installation in a shop and 12 dwellings at Hilden, Lisburn. N.I. Housing Trust, 12 Hope St, Belfast. Deposit 10s.

10 July — Bournemouth T.C. Sodium vapour main road lighting units. — See 24 June issue.

12 July—Aireborough U.D.C. Supply and erection of columns and brackets, and fitting and wiring of lanterns, and supply of lanterns and all ancillary gear for 250 W mercury discharge lighting along 2¼ miles of A. 658. Engineer and Surveyor, Council Offices, Micklefield Hse, Rawdon, nr. Leeds. Deposit £2. 2s.

12 July—Brentford and Chiswick T.C. Street lighting columns, lantern units, and control gear in Great West Rd.—See 24 June issue.

12 July—Camberwell B.C. Two pedestrian controlled electric trucks.—See 24 June issue.

12 July—Keighley T.C. Supply and erection of 59 concrete columns, arms and all equipment for class B street lighting on Braithwaite estate. Borough Engineer, College St.

12 July—Maidstone T.C. Rewiring and relighting at Corn Exchange.—See 24 June issue.

12 July—Queensbury and Shelf U.D.C. Sodium street lighting equipment for about 62 points.—See 17 June issue.

13 July—Newhaven U.D.C. Supply and erection of street lighting poles and fittings for about 1¼ miles of main road. Engineer and Surveyor, A. E. Moyter, Council Offices, Fort Rd.

14 July—Co. Antrim. Installation at intermediate school, Larne. — See 24 June issue.

14 July—Newcastle-on-Tyne T.C. Installation in 215 houses on Fawdon estate. —See 24 June issue.

14 July — Cumberland. Installation of electricity at St. John's boys', girls,' and infants' school, and St. Michael's school, both at Workington. J. H. Haughan, county architect, 15 Portland Sq, Carlisle.

15 July—Newbury T.C. Electrical installation in conversion of Newbury Hse into 10 flats. Borough Surveyor and Water Engineer, Municipal Bldgs.

15 July—Roxburgh. Electrical installation in alterations at West End, Denholm. County Architect, County Offices, Newton St, Boswells.

15 July—Sutton and Cheam T.C. Sodium street lighting scheme along about 3·15 miles of roads.—See 24 June issue.

16 July—Sheffield T.C. Electrical installation at (*a*) Hinde House, and (*b*) Silverdale, secondary modern schools. J. L. Womersley, City Architect. Town Hall, Deposit £2 in each case.

19 July—Dumfries. Electrical work in erection of boilerhouse at Royal Infirmary. M. Purdon Smith, 33 Castle St.

19 July—Durham T.C. Rewiring of town hall. —Advertised in 24 June issue.

19 July — King's Lynn T.C. Vertical spindle borehole type pump with ancillary equipment. — See 17 June issue.

19 July — Manchester T.C. Alterations and additions to electrical installation at Park Hall, Thurloe St. City Architects, PO. Box 488, Town Hall. Deposit £1. 1s. —Advertised in this issue.

19 July—Oldham T.C. Supply and erection of concrete columns and supply of lanterns for group A street lighting. C. Worswick, Lighting Superintendent, Gas St. — Advertised in this issue.

19 July—Southend-on-Sea T.C. Electrical installation in West Leigh primary school, Ronald Hill Grove. Borough Architect, 30 Alexandra St, Southend. Deposit £2.

20 July—Epping U.D.C. Installation of electricitv in 20 houses.—Advertised in 10 June issue.

19 Aug—Belfast T.C. Supply and erection of four 630,000 lbs. p.h. motor driven boiler feed pumps and one 650,000 lbs. p.h. steam turbine driven boiler feed pump, for first extension of Power Station West. Tender No. N.1274. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s. —Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 128 queries answered this week

"Turbinet" vacuum cleaners, makers of? Y.E.B.—British Vacuum Cleaner and Eng. Co., Ltd., Goblin Works, Ermyn Way, Leatherhead.

"Desco" fusegear, makers of? T.E.—G. P. Dennis Ltd., Fleming Rd, Speke, Liverpool.

Willenhall Electric Elements, address for? L.E.B.—We presume this refers to Electric Elements (Willenhall) Ltd., Wolverhampton St, Willenhall, Staffs.

"Gloria" vacuum cleaners, makers of? Y.B.—Sterling Eng. Co., Ltd., Sterling Works, Dagenham, Essex.

Electric Bedwarmers Ltd., address of the head office? D.H.—This new company noted in the 13 May, 1954, issue is not yet in operation, the address of the registered office is: 11 Mansfield St, W.1.

Carlisle Electrical Mfg. Co., Ltd., products—address for spares? B.F.—The Dexray Eng. Co., Ltd., Brook St, Manchester 1, took over the switchgear side of the Carlisle business. It should be noted however that the address of the Carlisle Electrical Mfg. Co., Ltd., is Bent St, off Derby St, Cheetham, Manchester 8.

"Protos" hot water jugs, makers of? L.O.L.—Siemens-Schuckert Werke, A. G. Erlangen, Bavaria, we have no note of any agents at the present time.

26 July—Leeds. Electrical services in twin operating theatre unit at County Hospital, York.—See June 17 issue.

28 July—Ilford T.C. Plant and equipment, for Roden St sewage pumping station.—Advertised in 24 June issue.

30 July—Taunton T.C. Sewage and storm water pumping plant, etc.—See 10 June issue.

31 July—Belfast. Electrical installation in St. Patrick's Training School, Glen Rd. J. R. W. Murland, consulting engineer, 13 Wellington Place. Deposit £5. 5s.

20 Sept. — N. of Scotland H.E. Board. Two steam generating units and ancillary apparatus; piping; modifications to coal and ash handling plant etc, at Carolina Port power station. — Advertised in 24 June issue.

No date stated—Co. Tyrone. Electrical Installation in farm buildings at Sixmilecross.—See 24 June issue.

No date stated — Fort William T.C. Installation in 16 houses at Claggan site. —See 24 June issue.

No date stated—Midlothian. Installation in school at Dalkeith.—See 24 June issue.

No date stated—Aberdeen. Installation of electricity at Drumoak library. County Architect's Dept., 25 Union Terr.

. . . and Overseas

Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.

16 July—New Zealand. Supply of total of 9,250 yd. of 6,600 V cable for Auckland Electric Power Board, Queen St, Auckland. B.o.T. (Ref.: E.S.B. 15603/54).*

16 July—New Zealand. Supply of six 450 kVA 3-phase transformers for Auckland Electric Power Board, Queen St, Auckland. B.o.T. (Ref.: E.S.B. 15602/54).*

20 July — Persia. Procurement Office USOM/1, Lalezar Nov, Tehran, invites tenders (No. 430-125724-4320) for 30 sets diesel electric generators, capacity 5 kW 220 V single phase 50 c/s self-regulating and excited, and maximum voltage variation 2% from full load to zero. B.o.T. (Ref.: ESB 15249/54).*

20 July—Uruguay. Supply of 400 metres of 3 paired armoured telephone cable for Administracion Municipal de Transportes Colectivos de Montevideo. Specif. No. 477. B.o.T. (Ref.: ESB 14847/54).*

29 July—India. Tenders (No. Engg./SPI/15015/E/II/54) invited for supply of vacuum impregnating plant comprising impregnator, vacuum exhauster, varnish container with electrical heating, and piping etc. Directorate General of Supplies and Disposals, Govt. of India, Shahjahan Rd, New Delhi. B.o.T. (Ref.: ESB 15553/54).*

19 Aug.—South Africa. Supply etc. of seven electrically driven pumps with motors etc, for Union Tender and Supplies Board, Bosman and Schoeman Sts., P.O. Box 371, Pretoria. Tender No. 68-1954/55. B.o.T. (Ref.: ESB 15278/54).*

1 Sept.—India. Tenders invited for electric locomotives, coaching stock, components, boilers, etc. for 1955-56 rolling stock programme of Govt. of India's Railway Board. List divided into two parts for which closing dates are 1 Sept and 1 Oct. Details, quoting ref. S.661/54/C.B./RLY, from Director-General, India Stores Dept., 32-44 Edgware Rd, London, W.2.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 29 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	239	−½	252
„ (3 months)	237	−½	—
LEAD, refined pig, min. 99·97% purity (cash)	98	+1⅛	90⅝
„ (3 months)	95½	+⅜	88⅛
TIN, refined, min. 99·75% purity (settlement)	750	+22½	663¾
„ (3 months)	746	+20	658⅝
ALUMINIUM, ingots 99-99·5%	156	—	150
ZINC, virgin, min. 98% purity (cash)	78½	−⅜	72½
„ (3 months)	79⅛	−⅛	71⅞
RUBBER No 1, RSS. spot (per lb.)	20¼d.	+⅛d.	19½d.
„ c.i.f. basis, ports. Sept. (per lb.)	20d.	+1/16d.	19⅛d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	—	51½
Mild Steel Tape (0·014 in.)	40½	—	40

3 Sept.—Australia. Supply of six 7,500 kVA 3-phase, 50 P.P.S. 33,000 V delta to 11,000/6,350 V star, step down outdoor type transformers with oil and onload tap changing. Tender No. E19/54. Specification from Chief Engineer and Manager, Dept. of Electricity, Kelvin Hse, Adelaide St, Brisbane, at 10s. 6d. per copy.

16 Sept—Uruguay. Supply of electric pump with corresponding accessories and electric motor for waterwork in City of Paysandu. Obras Sanitarias del Estado. B.o.T. (Ref.: ESB 15407/54).*

30 Sept.—Australia. Manufacture, supply, erection etc. of steam generating plant for Port Augusta B power station: four or five units each of 360,000lb./hr. capacity. Documents from Preece, Cardew and Rider, consulting engineers, 8, Queen Anne's Gate, Westminster.

No date stated—Italy. Installation of electrical power station (250 kW) with electrical power lines and transformer station for supplying pumping station, in fourth Slice Fuel Storage project at Cagliari. Closing dates not yet known but firms are advised to communicate immediately with Ministerio della Difesa-Marina, Direzione Generale del Genio Militaire per la Marina, Lungotevere della Navi, Roma.

Contracts Placed

South Shields T.C. Installation in additions to grammar and technical school for girls, A. Robertson Ltd., £1,392.

Carlisle T.C. Electrical installation in 61 houses, North Western Electricity Board.

Newcastle-on-Tyne. Electrical installation in W. Fawdon primary school, £1,810, and in additions to College of Industrial Design, £165, A. S. Lowrey.

Longbenton U.D.C. Installation in 78 houses on Kelvin Pk, Holystone and Croft estates, Forest Electrics.

Glasgow T.C. Provision of goods lift at Purdon St store of Education Dept., John Bennie Ltd., £1,474.

Peterlee (Dur.) Electrical installation in 144 houses at Acre Rigg for Development Corpn. G. Pearson.

Lossiemouth and Brandenburgh T.C. Supply and erection of street lighting equipment in burgh. A. McKinnon.

Portrush (Antrim) U.D.C. Installation of fluorescent lighting in main streets and approach roads, N. Ireland Electricity Board, £17,500.

Stockport (Ches). Installation in nine service shops in Brinnington neighbourhood unit, Jones, Morris and Co., £924.

Ipswich T.C. Supply of columns and fittings for scheme of improved street lighting along various roads, General Electric Co., Ltd., £6,061; installation of cables, wiring, etc, Eastern Electricity Board, £2,122.

Gazette Announcements

COMPANIES ACTS

Accessories Supply Co., Ltd. Last day for receiving proofs in respect of intended dividends, 10 June. Liquidator is J. B. G. Moore, Official Receiver, Queen's Bldgs, 55 Queen St, Sheffield.

H. G. Cockram Ltd. Liquidator appointed is N. W. Osborne, 11-12 Finsbury Sq., E.C.2, with committee of inspection.

Clayton, Lewis and Miller Ltd. Liquidator, D. D. Mathieson, 103 Cannon St, E.C.4, released as from 3 June.

F. W. Shearman Ltd. Resolution for voluntary winding-up passed at meeting on 22 June. Metcalfe Collier, 199 Piccadilly, W.1, has been appointed liquidator.

Mouldensite Ltd. Final meeting will be held at 12 Hobart Place, S.W.1, on 29 July at 2.30 p.m. to receive report of winding-up.

S. Oliver and Son (Refrigeration) Ltd. Meeting of members and creditors will take place at 11-12 Finsbury Sq, E.C.2, on 3 Aug. at 3 p.m. to receive liquidator's report.

Damard Lacquer Co., Ltd. Final meeting at 12 Hobart Place, S.W.1, on 29 July at 2.30 p.m. to receive liquidator's report.

BANKRUPTY ACTS

Receiving Order

Brighton. Edward T. M. Marshall, trading as G.E.M. Radio Electric at High St, Hurstpierpoint. Date of receiving order, 22 June.

Release of Trustees

Burnley. Hubert Scholfield, trading as Greenfield Electric Co, at 97 Deardengate, Haslingden. Trustee was F. C. Ormrod, 20 Byrom St, Manchester.

Chelmsford. Jacob Barnett and Maurice Barnett trading together as Barnett Supplies Co., at 102 and 104c Cranbrook Rd, Ilford. Trustee was N. W. Osborne, C.A., 11-12 Finsbury Sq., E.C.2.

BUSINESS PROSPECTS

Home

Alloa. Plans approved by Dean of Guild Court for new premises and offices for Alloa Glass Work Co., Ltd., at Loan. Estimated cost £40,000.

Ashby-de-la-Zouche R.D.C. Tenders may soon be sought for erection of 98 houses on Station site, Donnisthorpe.

Barnes. It is planned to erect R.C. church in Castelman. Architects are Archard, Worrow and Hardy, 20 Lowndes St, S.W.1.

Barrow-in-Furness. Gilbert and Kellett Ltd. have submitted plans for extension to factory.

Basingstoke. Approval given to erection of further 100 houses at Bishops Enclosure, Tadley Common.

Bicester U.D.C. Plans to be prepared for erection of 127 houses in Western Development scheme.

Biddulph (Staffs) U.D.C. Layout plans approved for civic centre on Park Lane estate, providing for town hall with municipal offices, police station, health centre, bus station, shopping centre, cinema and other buildings.

Bournemouth. Plans submitted for rebuilding Punshon Memorial Methodist Church in Exeter Rd. Estimated cost, £65,000. Architect is R. Sims of Lawrence and Partners, 93 Southbourne Rd, Southbourne.

Bristol. J. W. Mackintosh, 2 Tyndall's Park Rd, is architect for factory in Wood St for Thomas and Evans Ltd.

Carmarthen. Construction of new county police headquarters at Friar's Park. W. T. Lloyd, county architect, County Hall, Carmarthen.

Chippenham T.C. Erection of 27 houses on London Rd site. Borough Surveyor and Waterworks Engineer, 10 Market Place.

Coalville (Leic.) U.D.C. Tenders to be invited for erection of 58 houses on Greenhill estate.

Derbyshire. Approval sought to extend Chesterfield College of Technology to nine storeys. Estimated cost is £110,000.

Felling U.D.C. Sketch plans for third stage of Leam Lane development scheme approved. Work includes provision of schools, public house and 477 houses.

Glasgow. Plans prepared for new factory at Moncur St, Calton, by Western Manufacturing Co. (Clothing) Ltd.

Greenock T.C. Dean of Guild Court has approved plans for five blocks of houses in Grieve Rd, and 122 houses at Larkfield, for Scottish Special Housing Assoc.

Henley-on-Thames T.C. Scheme proposed for electrification of existing ejector sewerage system.

Kendal T.C. Erection of 80 dwellings on Hall Garth estate. J. Barnfather, Borough Engineer and Surveyor, Municipal Offices, Lowther St.

Leicester T.C. It is planned to build 190 houses on Eyres Monsell estate and further 100 on Mowmacre Hill estate.

Luton. A light engineering factory in Burr St is proposed by Vehicle Supplies Ltd. Similar plans prepared by L. N. Richardson for premises in Wingate and Arundel Rds. T. Lye and Son Ltd are to rebuild part of their factory in New Bedford Rd.

Northampton. New secondary modern school for girls is to cost £139,626 and £70,000 to be spent on extensions to girls' grammar school. Also third phase of technical high school is expected to cost £94,140.

Northfleet (Kent) U.D.C. Construction of 60 houses on Painters Ash estate. Engineer and Surveyor, Council Offices.

Rochford (Essex) R.D.C. Construction of 30 flats and 2 shops in Rochford Garden Way. Engineer and Surveyor, Council Offices.

Southport T.C. Scheme to be prepared for proposed lighting and heating improvements at Mortuary at Duke St.

Stamford (Lincs.) T.C. Tenders likely to be invited soon for wiring pre-war council houses.

Stoke-on-Trent T.C. It is planned to build 192 houses at Smallthorne, and 26 at Honeywall, Princes St and Jubilee Rd. Approval sought for six storey flats, and three-storey flats on Blurton Farm estate.

Wallasey T.C. Construction of 30 houses in Digg Lane, Moreton. Borough Architect, Town Hall.

Weston-super-Mare T.C. Erection of 54 houses on Coronation estate. R. G. Lickfold, town clerk, Town Hall.

Wigtown T.C. Plans approved for 66 houses to replace old dwellings at Glenluce, Sandhead, Castle Kennedy and Lochans.

Woodbridge U.D.C. Erection of 16 houses on Peterhouse estate and 26 on Nuneaton Rd site. Surveyor's Office, 17 Thoroughfare.

Overseas

Australia. Richard Foot (Australia) Pty., Ltd., 89 Elizabeth St, Sydney, wish to represent U.K. manufacturers of scientific instruments; including electronic instruments, test and measuring equipment for industry and research, recording instruments and meteorological instruments.

Canada. J. S. Edwards, of 1206 Hamilton St, Vancouver 3, wishes to contact manufacturers of rubber tape used for insulation on electrical wiring. They also want supply of friction tape.

Pakistan. A firm in Pakistan is seeking connection with manufacturers of small pumps suitable for pumping water from ground level to roof tanks for domestic consumption, and small capacity tube well surface pumps. Interested firms should contact U.K. Trade Commissioner, Chamber of Commerce Building, Agrabad Rd, Dewanhat, Chittagong.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Casbond. 727,550. Class 9. Electrical apparatus and instruments. Plessey Co. Ltd., 56 Vicarage Lane, Ilford, Essex.

Vicom. In design 727,013. Class 9. Specification includes electrical apparatus. Vicom and Co. Ltd., Bourn Airport, Bourn, Cambridge.

Centro. 726,593. Class 11. Torches, handlamps, lamps and sockets. S. D. Sullam Ltd, Africa Hse, Kingsway, W.C.2.

Aristocrat. 726,943. Class 11. Lighting fittings. Allen and Pope Ltd, 14 Shacklewell Lane, Dalston, E.8.

TRADE NOTES

Change of Address. The Manchester address of the Electrical Power Engineers Association is now: 95/96 Cromford Hse, Cromford Court, Manchester 4.

All communications for Perihel Ltd, should now be addressed to West Mall Works, 27/29 Rabbit Row, London, W.8.

Agent. Mr A. Sloss, 15 Wellington St, Glasgow, C.2., has been appointed agent for Scotland for G.B.M. (Electrical) Birmingham Ltd. He will carry stocks of their oil-filled electric radiators and immersion heaters.

The Sunbeam Electric Co., which has been set up in this country by Sunbeam Corporation, of Chicago, is completing plans for manufacture in the West of Scotland, it is reported. Production on a temporary basis was started at Hillington Estate, near Glasgow, pending completion of premises at East Kilbride. The London address of the company is 17 Dover St, W.1.

MEETING TO NOTE

THURSDAY, 1 JULY

INST. OF PHYSICS.—"Current Work at Bell Telephone Laboratories." Dr Karl Darrow. Royal Institn., Albemarle St, W.1, 6 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Greenside Electrical Co. Ltd., 94 Lower Wortley Rd, Leeds. To take over business of electrical, wireless and television contractor and dealer carried on at Leeds by P. Williamson. Nom. cap.: £4,000. Gov. dir. and ch.: R. Williamson.

Tensator Ltd. Mechanical, electrical and other balancing and tension mechanism manufacturers, etc. Nom. cap.: £100. Dirs.: J. E. Beckett, 4 Daleham Gardens, Hampstead, N.W.3, and B. Lermont.

Auto and Electrical Services (Morecambe) Ltd., Pedder St, Morecambe and Heysham. To take over business of (1) automobile electricians and electrical contractors carried on as "Autolex (Morecambe)" by Jack Wilkinson and Clifford S. Smith, at Eidsford Road, Morecambe, and (2) automobile engineer and garage proprietor carried on at Pedder Street, Morecambe, by Frank Smith as "Smith Service Station." Nom. cap.: £275. Dirs.: J. Wilkinson, C. S. Smith, J. Smith, F. Smith, H. Phillips and J. Woodhouse.

Martin's of Chelsea Ltd., 39 Kings Rd, S.W.3. Manufacturers of and dealers in electrical and mechanical apparatus, etc. Nom. cap.: £2,000. Dirs.: G. H. Martin, Mrs K. H. Martin and P. G. Martin.

Wilfred Fairburn Ltd., 244 Spring Bank, Hull. To take over business of engineer and electrical contractor, etc., carried on at Hull by Wilfred Fairburn. Nom. cap.: £2,500. Dirs.: W. Fairburn and Evelyn Fairburn, E. G. Ashton and G. Fairburn.

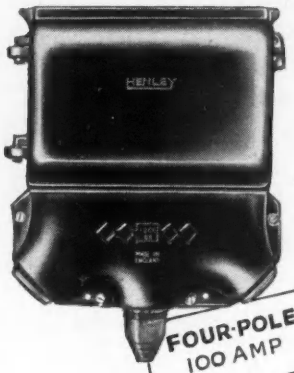
New Era Shade Co., Ltd., 199 Cheetham Hill Rd, Manchester. Manufacturers of and dealers in batteries, accumulators, etc. Nom. cap.: £5,000. Dirs.: H. Swift and S. Cohen.

HENLEY

HEAVY DUTY 100–500 AMP

IRONCLAD SERVICE FUSES

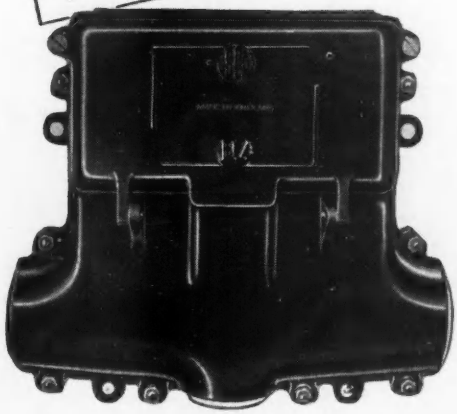
SINGLE-POLE
200, 300
500 AMP



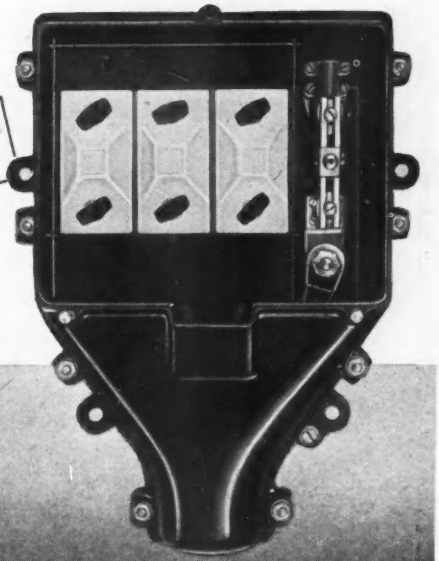
FOUR-POLE
100 AMP

HENLEY Heavy Duty Ironclad Service Fuses, suitable for Henley Wedge Type Cartridge Fuse-links, embody all the essential features necessary to ensure simplicity in installation and reliability in service. Only typical boxes are illustrated; full details of the range are given in Catalogue 38, available on request.

FOUR-POLE
200 AMP



FOUR-POLE
300 AMP



Specialists for over fifty years

W.T. HENLEY'S TELEGRAPH WORKS CO., LTD., 51-53 HATTON GARDEN, LONDON, E.C.1.

PHILIPS

Pioneers of
Sodium Lamps
are helping to make British roads safer after dark

RIGHT from the start Philips have pioneered Sodium Lamps—now used so extensively for public lighting, floodlighting and some types of industrial lighting. These Philips Sodium Lamps give up to five times more light than ordinary lamps of similar consumption, providing increased visual acuity, enhanced contrasts and reduced glare.

PHILIPS ELECTRICAL LTD.

LIGHTING DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

LAMPS • LIGHTING • RADIO • TELEVISION • 'PHILISHAVE' DRY SHAVERS
RECORD PLAYING EQUIPMENT • GRAMOPHONE RECORDS
'PHOTOFLUX' FLASHBULBS • ETC.

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

COUNTY BOROUGH OF OLDHAM

LIGHTING COMMITTEE

TENDERS are invited for the supply and erection of Lamp Columns and the supply of Electric Lanterns for Group A Lighting in accordance with a specification which may be obtained on application to Mr C. Worswick, Lighting Superintendent, Gas St, Oldham.

No tender will be accepted unless it is (*a*) received in a plain sealed envelope which shall not bear any mark or name indicating the sender, (*b*) endorsed "Tender for Lighting Equipment," and (*c*) addressed to the Chairman of the Lighting Committee, c/o The Superintendent, Lighting Department, Gas St, Oldham, to be delivered not later than 19 July, 1954.

The lowest or any Tender will not necessarily be accepted.

The Contract will be subject to the Standing Orders of the Council with respect to Contracts.

EDWARD HAINES,
Town Clerk.
(K 319)

CITY OF MANCHESTER

THE Welfare Services Committee invite tenders for Alterations and Additions to Electrical Installation at Park Hall, Thurloe St, Manchester: specification, form of tender and drawings may be obtained from the City Architect, P.O. Box No. 488, Town Hall. Deposit £1. 1s. (returnable). Tenders sealed in endorsed envelopes, must be delivered before 10 a.m. 19 July, 1954.

PHILIP B. DINGLE,
Town Clerk.
24 June, 1954. (K 320)

CITY AND COUNTY BOROUGH OF BELFAST
Electricity Department

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

TENDERS are invited for the Supply, Delivery and Erection at the First Extension of Belfast Municipal Electric Power Station West of:

Four 630,000 lb per hour motor-driven Boiler Feed Pumps and one 650,000 lb per hour steam turbine-driven Boiler Feed Pump, the pump discharge pressure being approximately 1,220 lb per sq in.

Form of Tender (N.1274), Conditions, Specification and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliel Hse, Newcastle-upon-Tyne 1, on payment of a deposit of Five Guineas, which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Boiler Feed Pumps, Electricity Department" and endorsed with the name and address of the

continued in next column

continued from previous column

tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 19 Aug., 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

EYRE GORDON,
Chairman,
Northern Ireland Joint Electricity Committee.

Chichester Hse,
Chichester St, Belfast.
25 June, 1954. (K 336)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, *or a woman aged* 18-59; *unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order,* 1952.

EASTERN ELECTRICITY BOARD
Essex Sub-Area

JUNIOR ENGINEER—SOUTHEND DISTRICT

CANDIDATES should have had a sound technical education, preferably to Higher National Certificate standard and some experience of H.V. and L.V. distribution systems.

Salary will be in accordance with Class F, Grade 15 of the National Joint Board Salary Agreement commencing at £402. Future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience with details of present appointment and salary, should be submitted to the District Manager, Southend Eastern Electricity Board, 85 London Rd, Southend, Essex, within fourteen days of the appearance of this advertisement. (K 332)

SOUTH WESTERN ELECTRICITY BOARD
Taunton Sub-Area

APPLICATIONS are invited for the post of

(a) FITTER (ELECTRICAL)
(b) JOINTER (E.H.T.)

Wages and conditions of employment in accordance with N.J.I.C. Agreement for employees in the Electricity Supply Industry. Applicants for post (a) should have experience in the erection and maintenance of Switchgear and Transformers at voltages up to 33 kV.

Applications in writing to the Sub-Area Manager, Electricity House, The Parade, Taunton, not later than Friday, 9 July. (K 303)

YORKSHIRE ELECTRICITY BOARD
Head Office

SECOND ASSISTANT ENGINEER—DISTRIBUTION DESIGN (SUBSTATIONS) SECTION

DUTIES will include the design of indoor and outdoor primary substations operating at voltages of 33 kV and above, the selection of protective gear installations for the primary H.V. systems, the preparation of specifications and enquiries for substation plant, negotiations with manufacturers and inspection of equipment in course of manufacture.

Applicants should be Corporate Members of the Institution of Electrical Engineers and should preferably possess a University degree in electrical engineering. They should have a sound knowledge of substation requirements and have had experience of large H.V. substation construction. Specialist knowledge of H.V. switchgear or of protective gear would be an advantage.

Salary—N.J.B. Schedule C Class AX-EX Grade 2 £834/£1,083 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, not later than 15 July, 1954.

No. 5 (Wakefield) Sub-Area

Castleford District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Applicants must have at least a Higher National Certificate in Electrical Engineering or equivalent qualifications.

Salary—N.J.B. Class F Grade 11 £548/£565 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Road, Wakefield, not later than 15 July, 1954. (K 318)

HER MAJESTY'S COLONIAL SERVICE

ENGINEERS, POSTS AND TELEGRAPHS DEPARTMENT, NIGERIA

DUTIES include the supervision of African and European staff installing and maintaining several types of wireless equipment particularly V.H.F. single and multichannel.

Appointment is either pensionable on probation in the salary scale £910 x £40—£1,560 p.a. or on contract in the salary range £1,116 x £48—£1,898 p.a. with a gratuity of £100—£150 per annum on satisfactory completion of contract.

Free passages are provided for the officer, his wife, and an annual maintenance allowance or free passage allowance of £75 each is payable in respect of a maximum of two children. Leave is granted at the rate of 7 days for each month of resident service. Government quarters are provided if available at a low rental.

Candidates must have passed or be exempt from Parts A and B of the examination for Associate Membership of the Institution of Electrical Engineers, or hold a University degree in Electrical Engineering, with telecommunications specialisation, or be Assistant Engineers in the British Post Office with considerable experience in telecommunications practice. Detailed experience of the installation and maintenance of V.H.F. single and multichannel wireless equipment and varied experience of modern telecommunications practice is necessary.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number BCD.108/14/05. (K 314)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited from suitably qualified engineers for the following positions:

ASSISTANT ENGINEER (INSTRUMENTS)
FREEMEN'S MEADOW POWER STATION
LEICESTER
Vacancy No. 93/54/ET

Applicants should have had the Higher National Certificate or equivalent together with sound practical experience in the maintenance of instruments in a P.F. fired Generating Station.

Salary for this appointment will be within Class H, Grade 10 (£641/£667 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 12 July, 1954.

OPERATION AND EFFICIENCY ENGINEER,
DRAKELOW POWER STATION,
nr. BURTON-ON-TRENT
Vacancy No. 95/54/ET

Candidates should have wide experience of the operation and maintenance of a large Generating Station with P.F. Boiler Plant. The successful applicant will be responsible to the Station Superintendent for ensuring that all sections of the plant attain the specified efficiency and for the carrying out of special investigations and tests.

Corporate Membership of the Institution of Mechanical Engineers and/or Institution of Electrical Engineers is desirable.

Salary for this appointment will be within Class J, Grade 6 (£883/£918 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 19 July, 1954.

ASSISTANT SHIFT CHARGE ENGINEER,
SPONDON POWER STATION
Vacancy No. 96/54/ET

Applicants should possess the Higher National Certificate or its equivalent and have had experience in a responsible position in a modern Generating Station.

The salary will be in accordance with Class H, Grade 9 (£680/£706 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications 19 July, 1954.

These appointments will be pensionable within the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
(K 331)

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Principal: H. Baker, PH.D., A.M.I.C.E., A.M.I.MECH.E.

APPLICATIONS are invited for the post of ASSISTANT LECTURER, Grade B, in Electrical Engineering. It will be an advantage if the person appointed can teach to final City and Guilds standard in "Regulations" and "Installations Technology," but a candidate with wide industrial experience and ability to teach Electrotechnology and other electrical subjects to Ordinary or Higher National Certificate standard would be acceptable. Opportunity will be given to undertake some teaching of advanced character if desired.

Salary scale at present: £490 by £25—£765 per annum, with a further £60 for graduate or equivalent qualification and up to 3 increments of £18 each for approved periods of training. Regard may be paid to approved industrial experience when assessing the commencing salary.

Application forms, together with further particulars, may be obtained from the Registrar, Nottingham and District Technical College, Shakespeare St, Nottingham, to whom they should be returned not later than 14 July, 1954.

F. STEPHENSON,
Clerk to the Joint Education Committee.
23 June, 1954. (K 310)

SOUTH WEST SCOTLAND ELECTRICITY BOARD
Lanarkshire Sub Area

(1) APPOINTMENT OF 2ND ASSISTANT DISTRICT ENGINEER — UDDINGSTON DISTRICT

(2) APPOINTMENT OF 3RD ASSISTANT DISTRICT ENGINEER — MOTHERWELL DISTRICT

(3) APPOINTMENT OF GENERAL ASSISTANT ENGINEER — SUB-AREA PLANNING AND DEVELOPMENT DEPARTMENT.

APPLICATIONS are invited for the above appointments. Applicants should preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications.

The Salary and Conditions of Service for each appointment will be in accordance with the National Joint Board's Agreement, Schedule "A." The present Classification and Grading for each appointment will be as stated below.

The successful candidates for appointments Nos. 1 and 2 will require to reside within a reasonable distance of the respective District Offices, and for appointment No. 3 within a reasonable distance of the Sub-Area Offices at Hamilton.

(1) APPOINTMENT OF 2ND ASSISTANT DISTRICT ENGINEER — UDDINGSTON DISTRICT

Applicants for this appointment should have had a sound engineering training with subsequent experience in the operation and maintenance of H.V. and L.V. Switchgear, Overhead and Underground Distribution Systems, commissioning and routine testing of Feeder Protection Equipment, together with some experience of H.V. Fault Location.

The present Classification and Grading for this appointment is F.7, Salary £697/£718 per annum, which will be subject to the statutory deductions including superannuation.

(2) APPOINTMENT OF 3RD ASSISTANT DISTRICT ENGINEER — MOTHERWELL DISTRICT

Applicants for this appointment should have had a sound engineering training with subsequent experience in the operation and maintenance of H.V. and L.V. Switchgear, and Overhead and Underground Distribution Systems.

The present Classification and Grading for this appointment is F.9, Salary £607/£629 per annum, which will be subject to the statutory deductions including superannuation.

(3) APPOINTMENT OF GENERAL ASSISTANT ENGINEER — SUB-AREA PLANNING AND DEVELOPMENT DEPARTMENT

Applicants for this appointment should have had a sound engineering training and a knowledge of Short Circuit Calculations, "Load Flow" Diagrams and "Voltage Drop" Calculations, together with some experience in the design and layout of H.V. and L.V. Underground and Overhead Distribution Systems.

The present Classification and Grading for this appointment is K.13, Salary £583/£605 per annum, which will be subject to the statutory deductions including superannuation.

Application forms for the above appointments, which may be obtained from the undersigned or any other Sub-Area Manager, should be returned to this Office within 14 days of the date of this notice.

DUGALD SMITH,
137, Almada St, Manager.
Hamilton.
21 June, 1954. (K 300)

IMPERIAL COLLEGE

APPLICATIONS are invited for LECTURERS in Electrical Engineering from 1 Oct, 1954. Salary scale £600 x £50—£900; x £50—£1,150. Initial salary according to experience and qualifications. F.S.S.U. and Family Allowances. Candidates should possess a good honours degree in electrical engineering. The duties will include undergraduate and post-graduate teaching and research.

Applications, stating age, academic qualifications and experience, together with names of two referees, should reach the Head of the Electrical Engineering Department, City and Guilds College, S.W.7, not later than 30 July, 1954. (K 313)

LONDON ELECTRICITY BOARD
ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Design and Planning Branch of the Northern Sub-Area.

Applicants should preferably have had experience on mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 6—£458/£595. 7s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 10 days of the publication of this advertisement. Please enclose addressed envelope and quote ref. V/1764/T on all correspondence. (K 294)

SOUTH EASTERN ELECTRICITY BOARD
FIRST ASSISTANT DISTRICT ENGINEER
Weald District

SALARY N.J.B. Class D, Grade 5, £714/£731 p.a. Superannuable. Applicants preferably corporate members of the I.E.E., should have had considerable experience in electricity distribution work covering the planning, construction, operation and maintenance of systems up to 33 kV.

Applications on forms from W. J. Collins, A.M.I.E.E., Weald Manager, SEEBoard, Highgate, Hawkhurst, Kent, to be returned by 14 July, 1954.

SENIOR SALES REPRESENTATIVE
(MALE)
Sutton District

Salary £485 by £20—£545 p.a. plus London Weighting under N.J.C. Grade 2. Superannuable. The person appointed will be required to give advice on supply matters, tariffs, and appliance sales and installation for domestic and small commercial consumers. Applicants must be thoroughly conversant with all types of domestic electrical appliances and in addition to acting as an outside representative must be prepared to carry out general showroom duties in any showroom within the Sutton District.

Applications on forms from C. W. Emanuel, M.I.E.E., Sutton Manager, SEEBoard, 52 High St, Sutton, Surrey, to be returned naming 2 referees by 14 July, 1954.

DEMONSTRATOR/SHOWROOM ASSISTANT
(FEMALE)
Woking District

Salary £400 by £20—£480 by £10—£490 p.a. N.J.C. Grade 1. Superannuable. Applicants should have showroom experience and be capable of demonstrating electrical appliances both in showrooms and on consumers' premises, and be in possession of an E.A.W. certificate.

Applications naming 2 referees on forms from J. C. Poole, A.M.I.E.E., Woking Manager, SEEBoard, 4 Chobham Rd, Woking, to be returned by 14 July, 1954.

A. L. BURNELL,
Secretary.
(K 334)

THE POLYTECHNIC
309 Regent Street, W.1

THE Governors invite applications for the post of HEAD OF THE ELECTRICAL ENGINEERING DEPARTMENT, duties to commence as soon as possible.

The post is recognised as a Grade 3, Heads of Departments, Burnham (Further Education) Scale appointment. Salary scale £1,190 rising by annual increments of £25 to a maximum of £1 340, plus London allowance of £36 or £48 per annum.

Applicants should possess a good honours degree and have had both teaching and professional experience.

Further particulars and form of application, which should be returned by 31 July, may be obtained by sending a stamped addressed foolscap envelope to the undersigned.

J. C. JONES,
Director of Education.
(K 305)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance.

GENERAL ASSISTANT ENGINEER—THAMES GRID CONTROL AREA LONDON
Vacancy No. 54/370

Technical education to Higher National Certificate and Power Station experience an advantage. Successful candidate must be prepared to work shift hours if required. Salary in scale, Class AX, Grade 8= £526. 1s. to £670. 19s. rising to ultimate maximum EX.8 £749. 14s. per annum.

FIRST ASSISTANT STATION CHEMIST—BARKING "C" GENERATING STATION
Vacancy No. 54/499

Candidates should possess experience in the analysis of fuels, oils, waters and materials of construction used in power generating and be competent to carry out *ad hoc* investigational work of an analytical character. Minimum qualification of Higher National Certificate is required in addition to experience. Salary—Class J, Grade 9= £754. 19s. per annum.

JUNIOR ENGINEER—WEST HAM GENERATING STATION
Vacancy No. 54/500

General and Control Duties (Shift). Good technical education with Power Station experience an advantage. Salary—Class H, Grade 14=£541. 16s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 328)

THE NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF ENGINEERING DRAUGHTSMAN (ELECTRICAL), SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, MANCHESTER

APPLICANTS should have had a suitable technical education and good drawing office training; experience of distribution network equipment would be an advantage.

Salary Scale: £433/£567 p.a. Schedule D, Grade 6, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 10 July, 1954. (K 316)

RADIO TECHNICIAN

required as Signals Assistant Inspector of Police by NYASALAND GOVERNMENT for one tour of 2-3 years with prospect of permanency. Salary, etc., £651 rising to £1,103 a year. Commencing salary according to experience. Outfit allowance £50. Uniform allowance £10 a year. Free passages. Liberal leave on full salary. Candidates must be between 21 and 30 years of age, of good education and physique, not below 5 ft 7 in. in height, normal vision without glasses. They must have a sound knowledge of H.F. and V.H.F. fixed and mobile simplex and duplex radio telephone systems and low power petrol/electric charges and alternators. Knowledge of morse and ability to instruct trainees in radio subjects desirable. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M1/36023/EE. (K 302)

THE SOUTH WALES ELECTRICITY BOARD
JOINTER E.H.T.

REQUIRED at their Construction Department, Dulais Depot, Pontardulais, near Swansea. Wages 3s. 9d. per hour for a 44-hour five-day week. Applicants must have had experience in jointing and handling all types of cable up to 33,000 V. Applications stating age, education, experience in present and previous positions, etc., to be addressed to the Sub-Area Manager, South Wales Electricity Board, Ystrad Rd, Fforestfach, Swansea, to reach him not later than Friday, 9 July, 1954. (K 337)

THE IRAQ PETROLEUM COMPANY

invites applications for the post of ASSISTANT LECTURER in Electrical Engineering at the Industrial Training Centre at Kirkuk, which provides training for Iraqi apprentices in technical subjects to O.N.C. standard. Candidates should have Degree or H.N.C., but essentially with practical engineering as well as teaching experience; desirably Teacher Training Course; previous overseas teaching experience an advantage as students' knowledge of English is necessarily limited.

Applicants, under 35, should be ready to take up appointments in September. Pensionable emoluments commencing from £900 (incremental) in addition to which there are further allowances varying from £432 p.a. to £720, according to family circumstances. Annual leave with paid passages.

Accommodation, which is provided by the Company is limited and therefore married applicants must be prepared for an initial period of family separation.

Write please, outlining experience and quoting No. 461 to Box No. 7773, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (K 301)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

OPERATION AND EFFICIENCY ENGINEER is required at Nechells "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade J5 of the Agreement, commencing at £942 per annum.

A wide knowledge of and experience in the operation and maintenance of a large generating station are essential, and the successful applicant will be responsible for the efficiency of the power station plant. Appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 699MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 17 July, 1954. (K 330)

KENT COUNTY COUNCIL
SENIOR ELECTRICAL ENGINEERS

APPLICATIONS are invited from Chartered Electrical Engineers for two appointments as above. Applicants must have had good experience in the preparation of schemes, specifications and estimates for electrical installation work. Salary within the range £695/£860 a year, according to experience.

Further details and forms of application obtainable from the County Architect, Springfield, Maidstone. (K 299)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Ref.: 149/2/DR/AJW.
Vacancy No. 66/54.

APPLICATIONS are invited for the following superannuable N.J.B. appointments in the Divisional Drawing Office, Construction Department. Salary Schedule D, Grade 6 (£433/£567 per annum).

1. ENGINEERING DRAUGHTSMAN (TRANSMISSION)

Candidates should have experience in one or more of the following:

(i) Layouts and diagrams for the installation of E.H.T. and L.T. Switchgear, Transformers and Cables.
(ii) Overhead Lines.
(iii) Protective Gear Systems.

2. ENGINEERING DRAUGHTSMEN (MECHANICAL)

Candidates should have experience in one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 12 July, 1954. 21 June, 1954. (K 338)

COUNTY BOROUGH OF BRIGHTON EDUCATION COMMITTEEE
Brighton Technical College

Principal: G. E. Watts, M.A., PH.D. (CANTAB.), B.SC. (*Lond.*), F.R.I.C.

REQUIRED as soon as possible: ASSISTANT LECTURER (Grade B) in Electrical Engineering with degree or equivalent qualification in electrical engineering and appropriate teaching and/or industrial experience, to teach Principles of Electricity and Electrical Technology to at least H.N.D. standard. Ability to offer one specialist subject in electronic or power engineering would be an advantage.

Salary, at present, £490 by £25—£765 plus graduate allowance £60 and increments for approved training and/or industrial experience.

Further particulars and application forms may be obtained from the undersigned. Completed forms should be returned to the Principal, Brighton Technical College, Brighton 7, within fourteen days.

W. G. STONE,
Director of Education.

Education Office,
54 Old Steine,
Brighton 1 (K 293)

BRITISH ELECTRICITY AUTHORITY
Headquarters, London

REQUIRE a SENIOR ASSISTANT ENGINEER in the Co-ordination Sub-Branch of the Generation (Station Construction) Sub-Department to co-ordinate construction work at a group of Power Stations. Candidates should preferably be corporate members of the I.Mech.E. or I.E.E., and practical experience in construction of modern power stations including handling of contracts, preparation of commissioning programmes, work on site and co-ordination of projects from inception to commissioning is essential.

Salary N.J.B. Grade I £1,002—£1,378 p.a. inclusive. Applications stating age, qualifications, present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 16 July, 1954. Quote reference ET/492. (K 327)

ELECTRICITY SUPPLY BOARD IRELAND
VACANCIES FOR: A. MECHANICAL OR ELECTRICAL ENGINEERS
B. GRADUATES OF I.MECH.E. OR I.E.E.

A. VACANCIES exist in the Board's Engineering Departments—Generation, Transmission, Distribution, Operation and Sales—for qualified electrical/mechanical engineers. The initial salary scale is £540 to £980 per annum, with higher entry point for those with suitable post-graduation experience or special qualifications.

The Board's extensive programme of expansion in all its Engineering Departments offers favourable opportunities of early promotion to higher grades. The first promotional grade carries a salary scale of £782/£1,061 p.a.

B. Vacancies also exist for which Graduates of the Institutions of Mechanical or Electrical Engineers will be considered, salary scale and starting salary being related to experience.

Applications with details of age, qualifications and experience should reach the Personnel Officer, 27 Lower Fitzwilliam St, not later than Thursday, 8 July, 1954.

PATRICK J. DEMPSEY,
Secretary.
(K 333)

THE ROYAL TECHNICAL COLLEGE, GLASGOW
Affiliated to the University of Glasgow
DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for a LECTURESHIP in the Department of Electrical Engineering. Applicants should hold a degree or equivalent qualification, and have had some industrial experience, preferably in the field of Electrical Measurements. The duties of the post include both teaching and research. The salary is on a scale £600/£50/£1,150. Forms of application may be obtained from the Secretary, George St, C.1. (K 329)

SOUTHERN ELECTRICITY BOARD

DEMONSTRATOR

SUNNINGHILL Branch, Staines District of No. 1 (Southall) Sub-Area. Salary N.J.C. Grade 1 (£400/£490 per annum). N.J.C. Conditions of Service.

Applicants should be women who are qualified to advise generally on the utilisation of electric domestic appliances, and to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill Lane, Southall, Middlesex, and returned to him not later than 16 July, 1954. (K 335)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

MAINTENANCE ENGINEER, Croydon "A" Power Station. Applicants should have had a sound technical education with experience in the maintenance of high pressure turbine and boiler plant, electrical plant and all power station auxiliary plant. Corporate membership of any of the recognised professional institutions will be an advantage. N.J.B. Conditions of service, Class F, Grade 5, £830. 11s. p.a. including London Allowance. Applications giving details of education, present position, experience, etc., should be received by the Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, Surrey, by 9 July, 1954. (K 309)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER (Buildings) required at the No. 2 Sub-Area Headquarters, Sandiway Hse, near Northwich, Cheshire. Salary £583/£605 per annum (N.J.B. K/13). Appointment superannuable and subject to medical examination.

Preference will be given to applicants who hold a Higher National Certificate in Building and who have had experience as a Clerk of Works. The duties of the post will include the supervision of new building work and the maintenance of existing buildings throughout the Sub-Area.

Standard application forms obtainable from the Manager, above address. Closing date: 12 July, 1954. (K 317)

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and N. Wales Division

(MERSEYSIDE AND N. WALES)

APPLICATIONS are invited for the position of SENIOR ASSISTANT ENGINEER (MECHANICAL) in the Construction Department, Springwood House, Woolton, Liverpool. Salary £970/£1,103 per annum. N.J.B. Class AX, Grade 1, Schedule "C." The appointment is superannuable and subject to medical examination.

Applicants should preferably be Chartered Mechanical or Electrical Engineers with experience in the design and construction of modern power stations. The successful applicant will be responsible to the Generation Engineer (C) for the design and construction of new, or extensions of existing power stations, including preparation of Specifications, checking Tenders, handling contracts and the general supervision of work on site.

Application forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date 9 July, 1954. (K 292)

FOR AUSTRALIA

CABLE INSTALLATION ENGINEERS

ASSISTANT ENGINEERS required for cable installation work for permanent service in Australia with large Cable Manufacturing and Contracting Company. Salary according to qualifications and experience. Applicants will receive a period of training in the United Kingdom before appointment confirmed. Apply stating age, qualifications and experience to:

Box No. 3657, Electrical Times. (K 344)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following post:

JUNIOR ENGINEER

LUTON GENERATING STATION

Salary Class E, Grade 15 £390—Grade 14 £445 per annum depending on qualifications, etc.

Duties include operation of a.c. and d.c. plant on shift, and technical assistance on boilers and turbines, and provides experience useful for subsequent promotion.

Applicants should have had training or experience in similar work. Technical training to Ordinary National Certificate standard, or equivalent, and experience or knowledge of Rotary Converting Plant will be an advantage.

Applications stating age, qualifications and experience, to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by 17 July, 1954.

W. N. C. CLINCH,
Controller.
(K 315)

THE BELMOS COMPANY LIMITED

Bellshill, Lanarkshire

RESEARCH ENGINEERS

APPLICATIONS are invited for appointments to the Staff of a research unit for work on problems associated with Control Gear, Contactors, and Low-voltage Switchgear. Candidates should have a good honours degree, and have completed a period of post-graduate industrial training. Preference will be given to those who have had some experience in an appropriate field of engineering or in experimental research.

Salaries will be commensurate with qualifications and experience, which should be stated in letters of application addressed to the Managing Director. (K 304)

TECHNICAL BRANCH MANAGER

WELL-KNOWN Company manufacturing the highest grade Motors, Rotating Electrical Machines up to 10,000 BHP, Transformers, Rectifiers, H.T. and L.T. Switchgear, Hand-operated and Automatic Motor Control Gear, require the services of a first-class Technical Branch Sales Manager.

Applicants should have a sound practical and technical training and preference will be given to one having a good connection with the heavy industries in the Middlesbrough area.

Remuneration will be on a generous scale, expenses and car being provided by the Company.

All applications will be treated in strict confidence. Pension Scheme available.

Apply, giving full details of Technical and Sales training to—Box No. 3645, Electrical Times. (K 323)

ALKALINE BATTERIES LTD., of Redditch, are the largest makers in the Empire of Alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its Technical Sales and Development Sections for Graduate ELECTRICAL ENGINEERS, not over 30 years of age, or for men nearing the end of their Degree Course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed to Commercial Manager, Alkaline Batteries Ltd., Union St, Redditch. (K 23)

A WELL-KNOWN Company manufacturing electric water heaters is expanding its sales force and wishes to recruit a number of REPRESENTATIVES for various parts of the country, preferably aged 25—35. Previous experience in this field of selling desirable but not essential. Initial salary £500/£600 according to qualifications, with plenty of scope for advancement. Applications should be in own hand writing giving full details of education, experience and age. —Box No. 3655, Electrical Times. (K 342)

AN opportunity occurs in progressive manufacturing concern in London area for ENGINEER aged 25/35 with electrical or physicist degree, on development and research work on high frequency telecommunication cable and associated testing equipment. Salary will be commensurate with qualifications and experience. Apply giving full particulars to—Box No. 3641, Electrical Times. (K 321)

CROMPTON PARKINSON LTD., Chelmsford, require person capable of dealing with enquiries and orders for automatic and manual starters and control gear, including Automatic Voltage Regulators for use with a wide range of A.C. and D.C. motors and generators. Superannuation scheme, extensive sports, social and welfare facilities. Write stating age, present salary, etc., to the Personnel Officer. (K 214)

COMMISSIONING ENGINEERS required by a well-known firm of Consulting Engineers. Duties will involve the commissioning of new boilers, turbo-alternators and power station plant and in some cases these plants are situated overseas.

Candidates will have to be prepared to attend foreign sites for short periods to commission plant.

Applicants must have had a number of years' experience in the operation of power plant and experience with diesel engines would be an advantage. The salary offered will be in accordance with the applicant's experience and qualifications. Applications should be forwarded to the Personnel Officer, Ewbank and Partners Ltd., 10/11 Grosvenor Place, S.W.1. (K 257)

CONTRACTS ENGINEERS required for handling of Switchgear tenders and contracts. Applications should state age, experience, qualifications and salary required and should be addressed to Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (K 256)

DRAUGHTSMAN (Junior) required by the General Electric Co., Ltd., for work connected with Industrial Heating, Cooking and Baking schemes. Applicants should not be older than 27 years of age, with O.N.C. standard and preferably some experience in this type of work. The position offers opportunities for progress with the Sales Organisation of the Company. Apply in writing, quoting reference I.H. to the Staff Manager, Magnet House, Kingsway, W.C.2. (K 339)

DRAUGHTSMAN required for Switchgear development work. Good salary offered to suitable applicant. Pension Scheme available. Reply stating age, salary, full details of technical qualifications and experience to Erskine, Heap and Co., Ltd., Lancashire Switchgear Works, Salford, Manchester 7. (K 192)

ELECTRICAL DRAUGHTSMAN, 25-30, preferably familiar with heavy industrial plant, practice and layout.

Knowledge of distribution systems up to 3,300 V. A.C. and D.C. motor control schemes and preparation of schematic diagrams.

Salary depending on age and experience. Superannuation scheme.

Applications to be received by 19 July addressed to Electrical Engineer, Guest Keen Iron and Steel Works, Cardiff. (K 171)

ESTIMATOR for Indoor Sales Staff required by Crompton Parkinson Ltd., Chelmsford. Applicants must have initiative and be experienced in dealing with enquiries relating to A.C. and D.C. rotating electrical machinery up to 1,500 h.p. /kW. Superannuation scheme, and extensive social, sports and welfare facilities. Write, giving fullest particulars, to the Personnel Officer. (K 213)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

ELECTRICIANS required; permanent jobs offered to first-class men; all systems. Apply Christy Bros. Ltd., 171 Broomfield Rd, Chelmsford. (K 296)

JOHNSON and Phillips require an ESTIMATOR AND TECHNICAL CORRESPONDENT in their Transformer Department. Preference will be given to a man experienced in the preparation of Tenders for the home and export market. Applications giving particulars of training and experience, together with age and salary required to Employment Manager, Johnson and Phillips Limited, Charlton, London, S.E.7. (K 173)

LIGHTING SALES ENGINEER with interest in specialised lighting for responsible position in London area. Good technical knowledge and ability to discuss architect's requirements essential. Write stating age, qualifications and experience to—Box No. 3653, Electrical Times. (K 341)

MAJOR Oil Company requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London. Age 25 to 30 years. Candidates should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualification. Good practical experience required followed by 3 to 5 years in the drawing office on electrical installations for Process Plants, Workshops and Factories. He will have opportunities of visiting refineries for periods of temporary duty. Opportunities for promotion to engineering appointments occur within the Company and with its Associates both in the U.K. and overseas. Write giving full details and quoting H.2067 to—Box 6760, c/o 191 Gresham House, E.C.2. (K 306)

REPRESENTATIVE required for well-known lamp manufacturers for Hampshire area. Permanent pensionable position. Age 24/35. Write giving age and full details of previous experience and salary required to—Box No. 3637, Electrical Times. (K 295)

REPRESENTATIVE required by well-known Domestic Appliance Manufacturers to cover the Midlands and North including Manchester, Leeds, etc. Wide experience of the Wholesale Trade, Electricity Boards and Local Authorities essential. Remuneration by salary, commission and expenses. Must be car owner. Position offers vast scope to successful applicant.—Box No. 3639, Electrical Times. (K 312)

REPRESENTATIVES with established connections amongst Electrical Retailers required. Commission basis.—Box No. 3633, Electrical Times. (K 260)

SWITCHGEAR ENGINEER. Switchgear Engineer to deal with enquiries and orders for H.T. and L.T. substation switchgear at Head Office. Some previous similar experience an advantage. Reply stating qualifications and experience to Personnel Manager, Ferguson Pailin Ltd., Higher Openshaw, Manchester 11. (K 307)

THE opportunity occurs for an ELECTRICAL ENGINEER, preferably between 35 and 50 years of age, experienced in installation work in buildings, and with sales contacts among architects and consultants, to participate in the management of an old-established Electrical Contracting Company in London. Salary good, prospects better. Replies will be treated in strict confidence. —Box No. 3651, Electrical Times. (K 340)

THE GENERAL ELECTRIC CO., LTD., have vacancies on the staff of their SALES ORGANISATION in London for young men of Ordinary National Certificate Standard in Electrical Engineering. Excellent opportunities for promotion exist for those interested in sales of most types of electrical equipment and in work on the drawing board. Applicants, having drive and initiative, should have had a sound general education and preferably previous experience in a Sales Organisation. Apply in writing, quoting reference "Gen.", to The Staff Manager, Magnet House, Kingsway, London, W.C.2. (K 274)

TECHNICAL ASSISTANT required for handling enquiries, tenders, specifications and general technical matters regarding Power Cables, including Supertension. Age 25-30. Applicants should have good technical background with H.N.C. or equivalent. 5-day week. Pension Scheme. Apply to the Secretary, W. T. Glover and Co., Ltd., Trafford Park, Manchester 17. (K 308)

TENDERING ENGINEER required by manufacturers of electrical rotating machinery. Previous experience in this field is essential and education to O.N.C. standard desirable. Five-day week; non-contributory staff assurance scheme. Salary according to qualifications and experience.—Box No. 3643, Electrical Times. (K 322)

WANTED. First class ELECTRICIANS, preferably with contracting experience. Good opportunity and permanency for suitable men. Good prospects. Apply, Lee, Beesley and Co., Ltd., 6 Warwick Row, Coventry or Lee, Beesley and Co., Ltd., 41 Snow Hill, Birmingham 4. (K 238)

X-RAY SERVICE ENGINEERS are required by a large London Company for service work throughout the country. Good salary and prospects for men with experience in this type of work. Applications, giving full details of age and experience should be addressed to Box ET 363, LPE, 110 St. Martin's Lane, W.C.2. (K 311)

APPOINTMENTS WANTED

ARGENTINA. Chartered mechanical electrical engineer, British, 56, fluent Spanish, own city offices, would handle firm's S. American projects, appraisals. Write DBP, B. Mitre 341, Buenos Aires. (K 178)

WANTED

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (K 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (K 1)

DIESEL ELECTRIC GENERATOR SET, approx. 20 kVA, 50 cycle, 230/400 V. Green Brothers (Electrical) Ltd., Brackley, Northants. (K 239)

WANTED—Scrap Lead, Brass, Copper; top prices: Recovered Mercury (quicksilver) 15s. lb upwards. Spot cash on delivery, or cash on collection arranged Greater London area: also Platinum and Silver Contacts, precious and non-ferrous scrap metals in all forms. Belgrave Buyers (E.T.), 5 Belgrave Gardens, London, N.W.8. MAI 7513. (K 176)

ALL CABLES and Flexes bought. B.D.C., 591 Green Lanes, London, N.8. (K 345)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (K 10)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (K 15)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (K 13)

BUSINESS OPPORTUNITIES

MANUFACTURER of new patented method of festoon lighting wishes to co-operate with an established lamp manufacturer, to sell E.S. and B.C. low wattage coloured lamps to holiday resorts, etc. Details in confidence to—Box No. 3649, Electrical Times. (K 326)

FOR SALE

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SALE BY TENDER

THE Merseyside and North Wales Electricity Board offer for sale the undermentioned equipment:

Item 1.—Two Sets E.E. Rot. Converters, 1,500 r.p.m., 250 kW., 460/500 V, D.C. Ltg. and 500/550 V D.C. Traction, with 2 Transfs. 275 kVA, 3/6 ph., 6,600 V, 50 c., complete with starting gear and D.C. switchboards.

Item 2.—One Set B.T.H. Rot. Converter, 1,000 r.p.m., 460/50 V D.C., with M.V. Transf. 550 kVA, 3/6 ph., 6,600 V, 50 c., complete with starting gear and D.C. switchboard.

The above items are offered for sale individually or as a whole without guarantee as to their condition, and may be inspected at the Board's Depot at Willow Rd, Wrexham, from 5 to 16 July, 1954, inclusive.

Forms of tender, obtainable from the Manager, No. 4 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, Near Wrexham, must be forwarded through the post under cover of the label provided, so as to be received at Electricity House, aforesaid, not later than noon on Friday 23 July, 1954.

The Board do not bind themselves to accept the highest or any tender and reserve the right to accept any portion of a tender.

M. M. PARKER,
Secretary.

Electricity House,
Love Lane, Pall Mall, Liverpool 3.
June 1954. (K 324)

LONDON ELECTRICITY BOARD

OFFERS are invited for the purchase and removal of approximately 300 Wood Framed Ironclad Sunk Type Fuseboards (Revo), 2-8 way and 15 amp and 50 Ironclad Combined Switch and Fuseboards. Full details and tender forms may be obtained on application to the Purchasing Officer, London Electricity Board, 46 New Broad St, London, E.C.2, not later than 9 July, 1954. (K 343)

SOUTH EASTERN ELECTRICITY BOARD

TENDERS are invited for scrap materials at Windsor Road Stores, Gillingham, Kent:

Approx. 5 cwt bare copper strand

Approx. 6 cwt mixed brass and copper.

Approx. 2 cwt lead.

Approx. 2 tons underground cable.

Inspection by arrangement with District Manager (Tel. Gillingham 5241).

Successful tenderer will be required to pay before collection. Tenders must be submitted in plain sealed envelope marked "Tender for scrap materials, Gillingham" and must reach the Secretary, SEEBoard, 10 Queen's Gardens, Hove 3, Sussex, by 5.15 p.m. on 19 July, 1954.

The Board does not undertake to accept the highest or any tender.

A. L. BURNELL,
Secretary.
(K 297)

HUNDREDS OF MOTORS IN STOCK

1, 2, and 3-ph. and D.C. all sizes Geared Motors, M.G. Sets and special equipment made up. Rewinds and redesigns all sizes, 12 months' guarantee on all supplies and rewinds. Lists sent on request.

EDWARDS, WYATT & COURT LTD.
Grant Street, London, E.13. Grangewood 3697

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (K 5)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel: Forest Hill 7089. (K 14)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (K 6)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (K 2)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (K 16)

FLUORESCENT BALLASTS—wide range —20 W, 30 W, 40 W, 80 W. Normal and high power factor. Built for long and dependable life—Optimum Performance—Quiet operation. Fully impregnated—Progressive compounding—Heavy encased housing—Quick deliveries. Data on request. Micramatic Ltd., Bournemouth, Hants. (K 20)

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Tel.: COLindale 4621/3,
Grams: Lectropowa, Hyde, London (K9p)

GRUBB IMMERSION HEATERS. New 3 kW embedded element models. List prices, 11, 14, 16 in., 45s., tax 16s. 5d.; 18, 20 in., 47s., tax 17s. 2d.; 22, 24, 28, 30 in., 49s., tax 17s. 11d. Also available in 2 kW. For trade terms and lists, write—John Owner and Co., Ltd., Springfield Rd, Birmingham 13. Tel. SPR 2939. (K 279)

HOBSON 5½ in. LATHES from £120. Eagle Surface Grinders 15 in. x 6 in. at £140. Victa Engineering Co., Maidenhead. Phone 50. (K 278)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (K 7)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW. 7221. (K 8)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (K 11)

ROTARY CONVERTER by Lancashire Dynamo Co. Input 220 V, 15 A, 3,000 R.P.M. Output 230 V, 17·5 A, 50 cycles, Single Phase, 4 kVA. Broadway Cinema, Bristol St, Birmingham. (K 298)

TINNED STEEL ARMATURE BINDING WIRE. All sizes from 14 s.w.g. to 30 s.w.g. supplied in coil or on reels.—Frederick Smith and Co., Wire Manufacturers Ltd., Caledonia Works, Halifax. (K 347)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. List from: J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel.: HOP 2759.) (K 21)

1 100 K.V.A. DIESEL ALTERNATOR, 400 V. 3-phase and N. New. Ellison, Keighley Rd, Colne. (K 159)

6 MOTORS AND STARTERS, ranging 10 to 20 b.h.p., 400 V, 3-phase, 50 cycles, excellent condition. Inspection. Wm. Bartlett and Son Ltd., High Wycombe. (K 240)

12 NEW BROOK R.13 SLIP RING MOTORS for sale, 7½ h.p., 1,420 r.p.m., 380/420 V, 3-ph., 50 cy., F. J. Edwards Ltd., 359 Euston Rd, London, N.W.1. EUS 4681. (K 289)

AGENCIES

AGENTS wanted with live connection among electrical wholesalers to represent manufacturers of a high quality product at competitive prices in the following areas: North East Coast, the North and East Ridings of Yorkshire, East Midlands and Midlands. Apply—Box No. 3629, Electrical Times. (K 246)

PROVINCIAL Lampshade Manufacturers require AGENTS all areas calling on wholesale trade. Full support given.—Box No. 3565, Electrical Times. (K 164)

REQUIRED live AGENTS calling on illuminating engineers at holiday resorts, to sell new patented fully proved method of festoon lighting.—Box No. 3647, Electrical Times. (K 325)

PATENTS

THE proprietor of British Patent No. 636775, entitled IMPROVEMENTS IN ADJUSTABLE SUPPORTS FOR LAMPS OR THE LIKE, offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Boulevard, Chicago 4, Illinois, U.S.A. (K 242)

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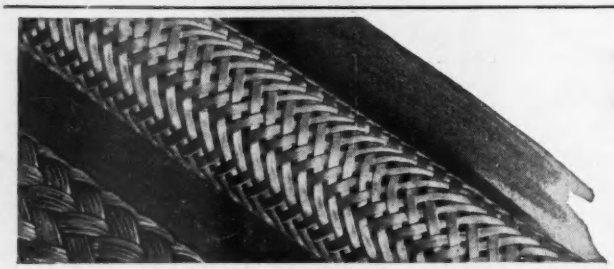

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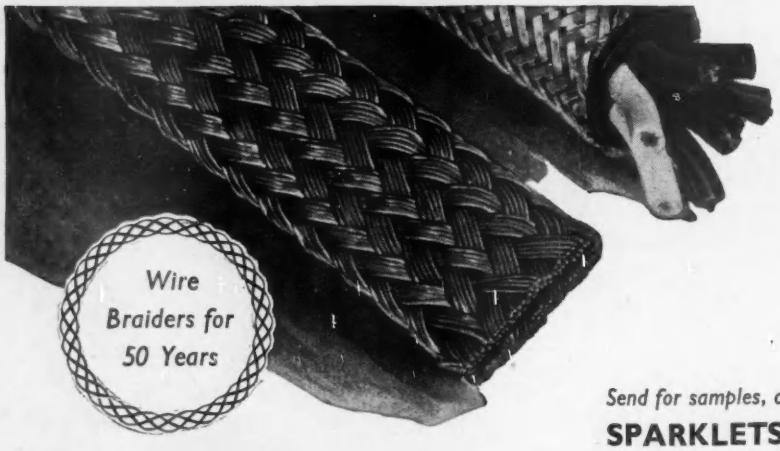

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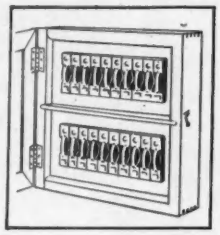

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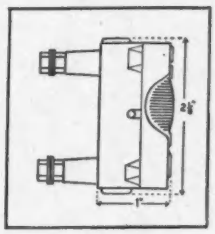

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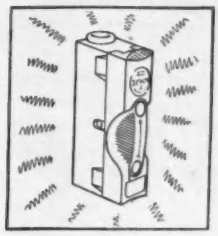

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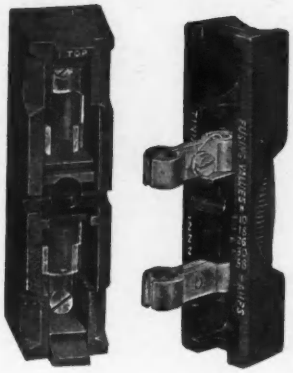

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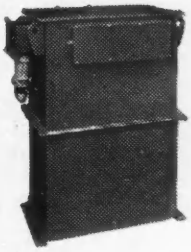

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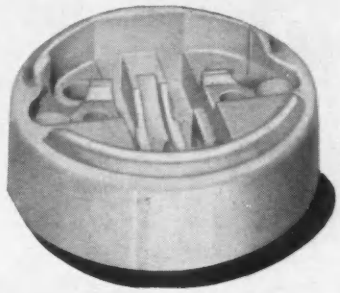

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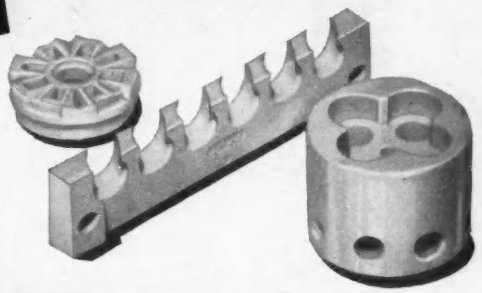

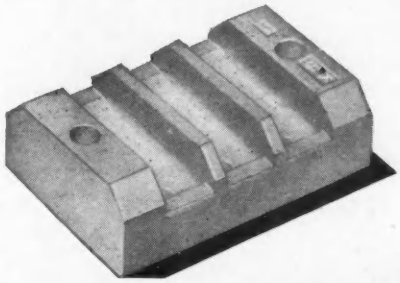

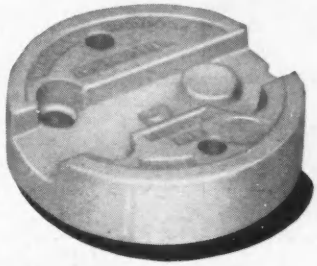

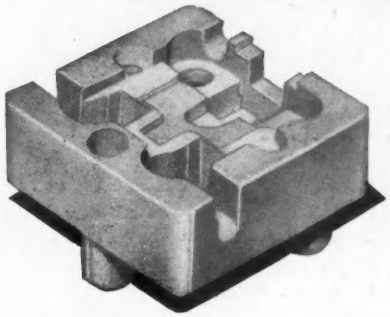

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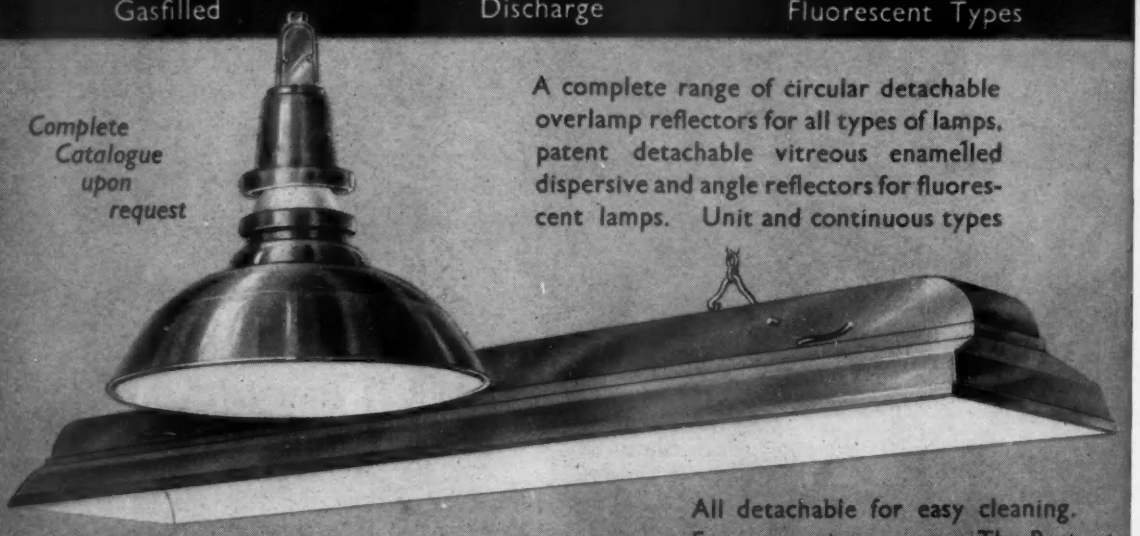

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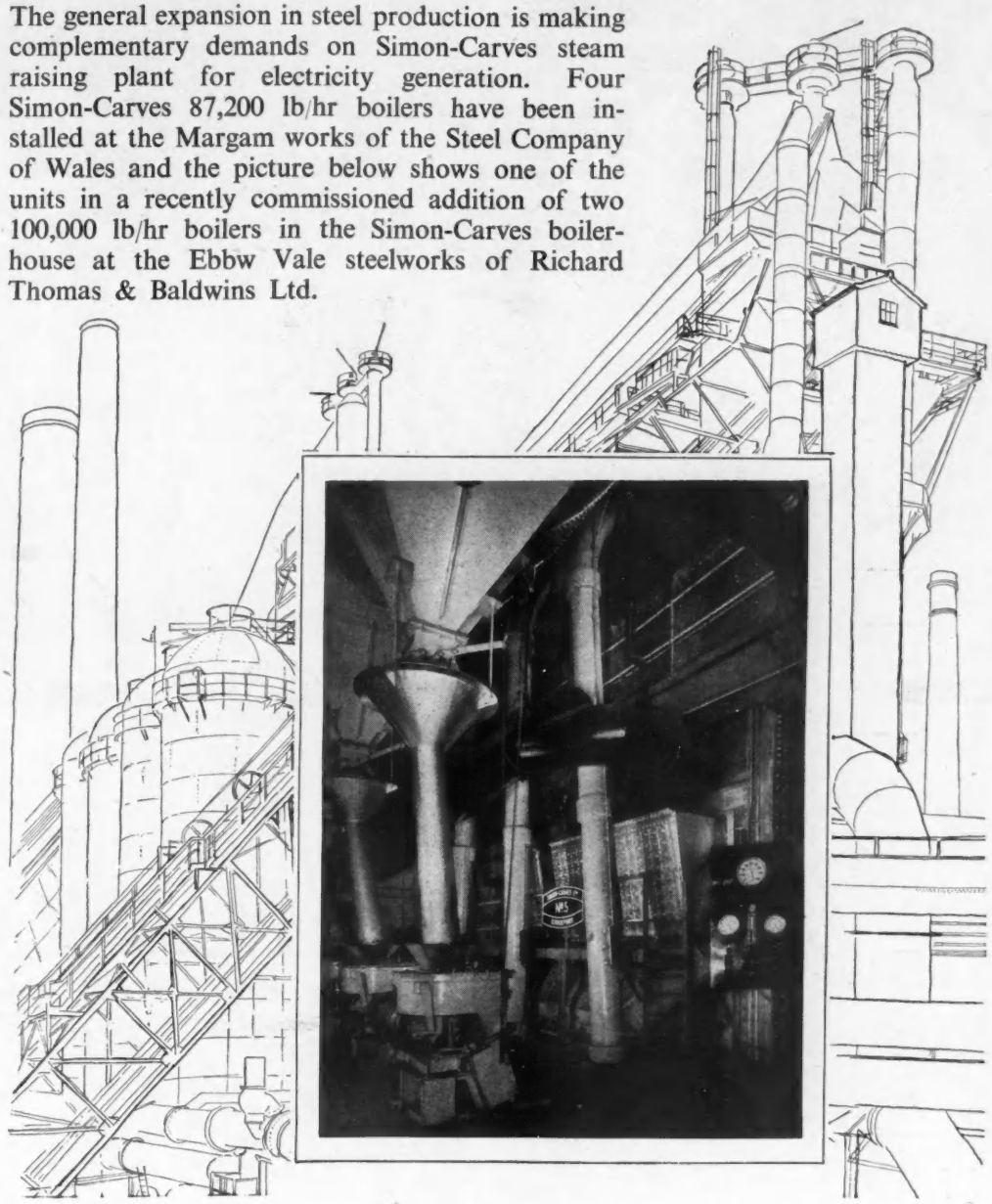

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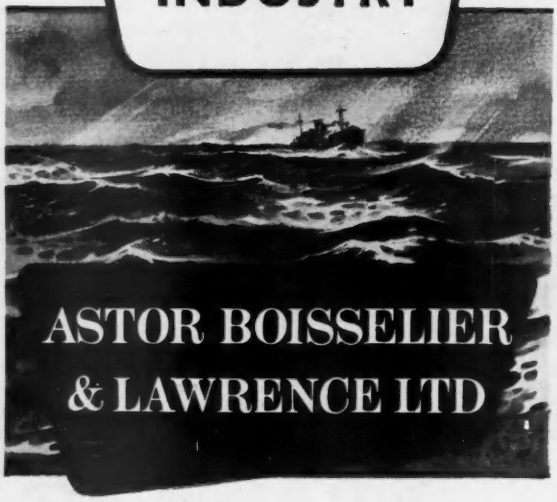

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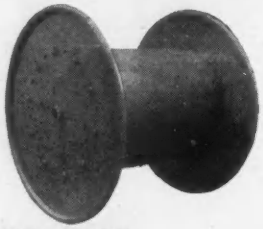

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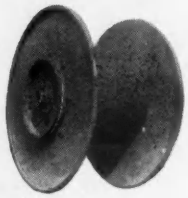

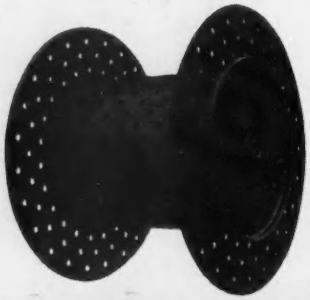

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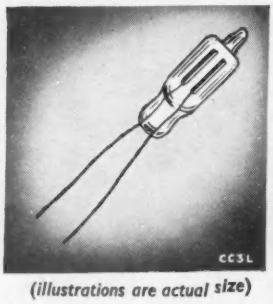

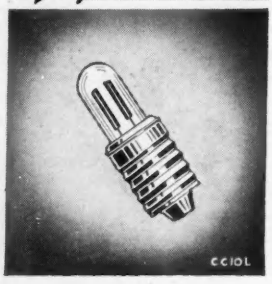

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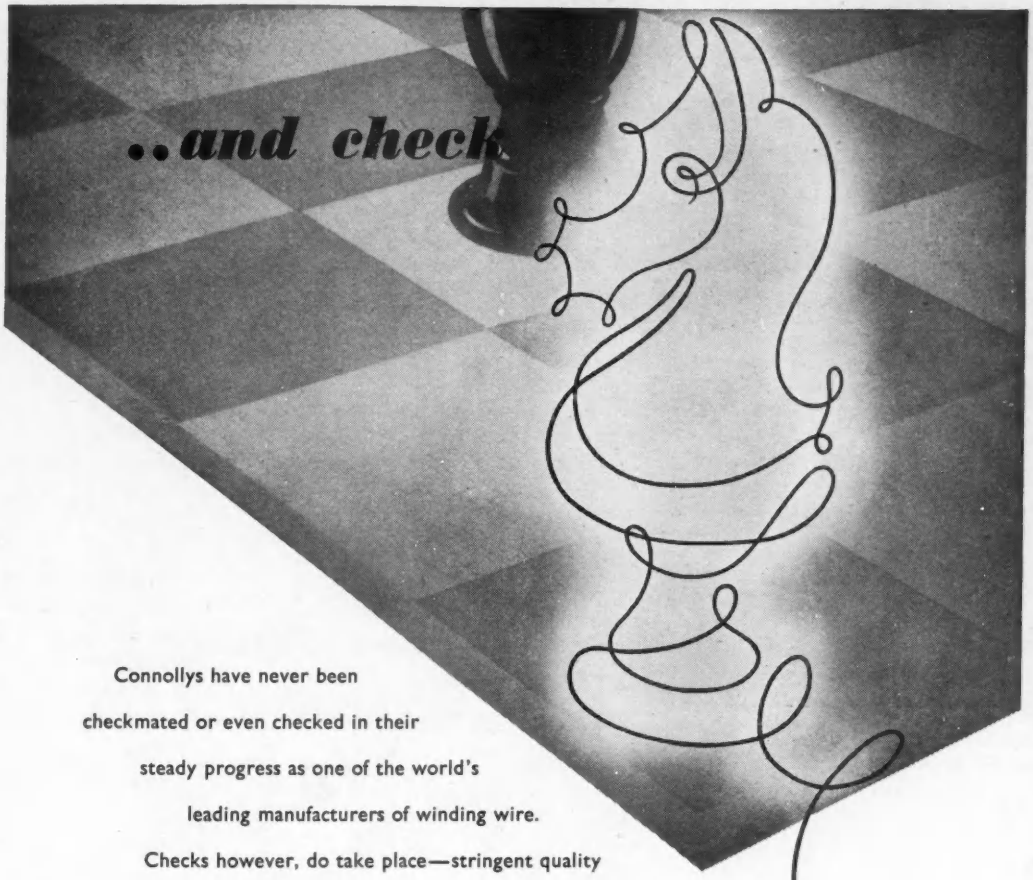

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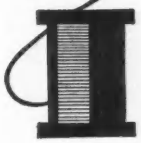

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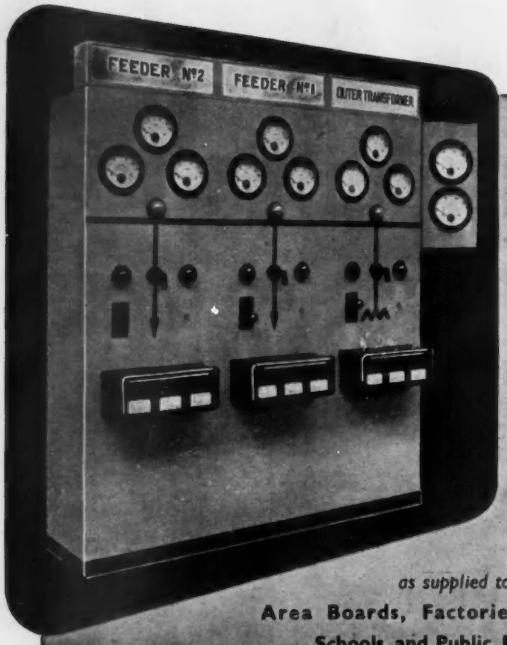

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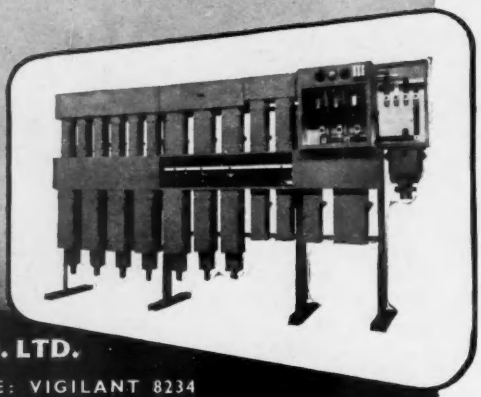

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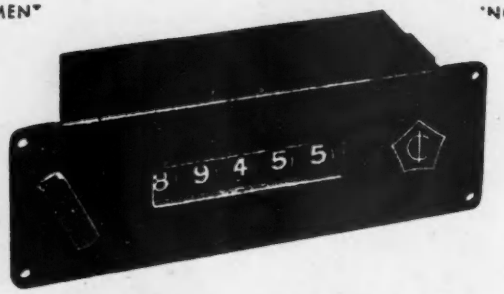

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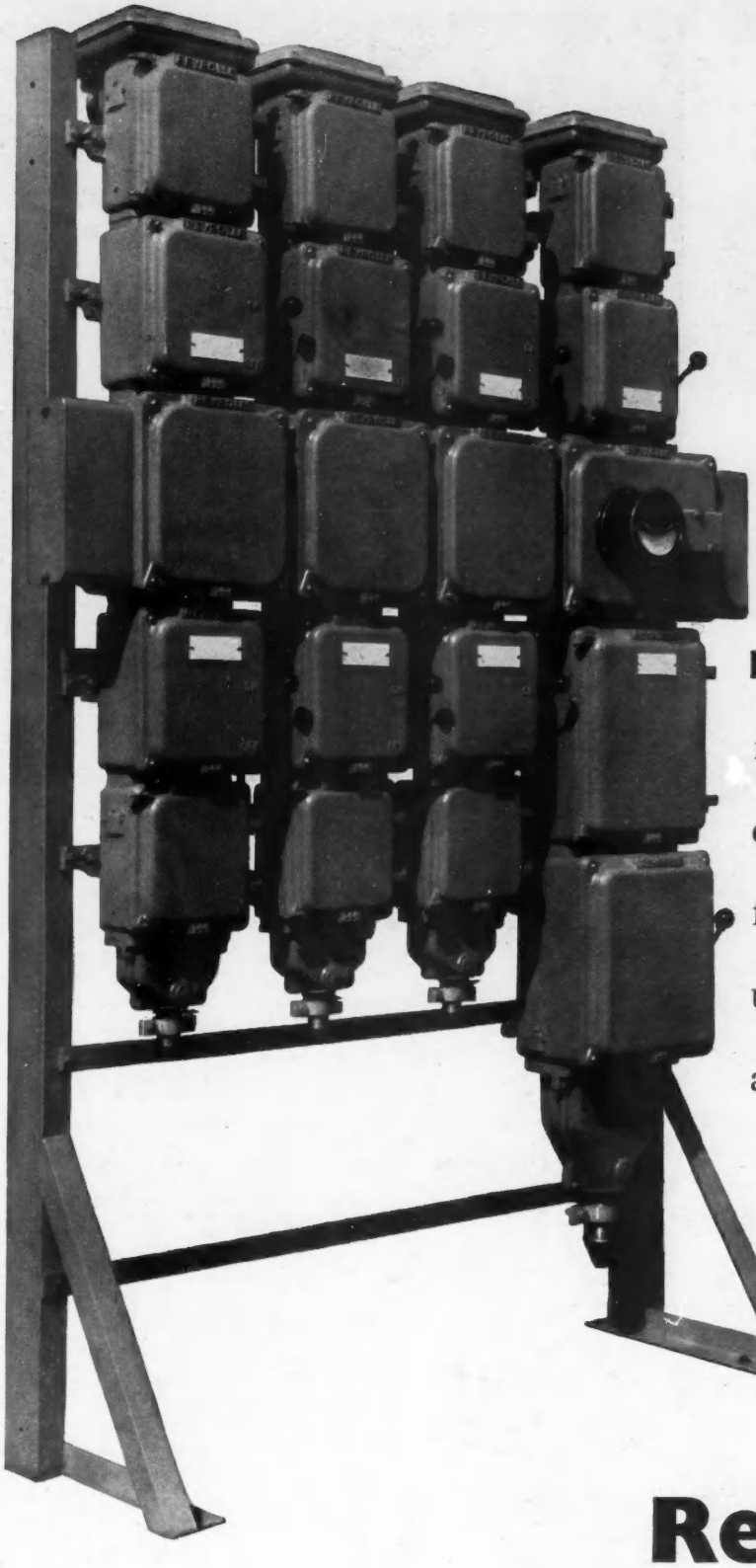

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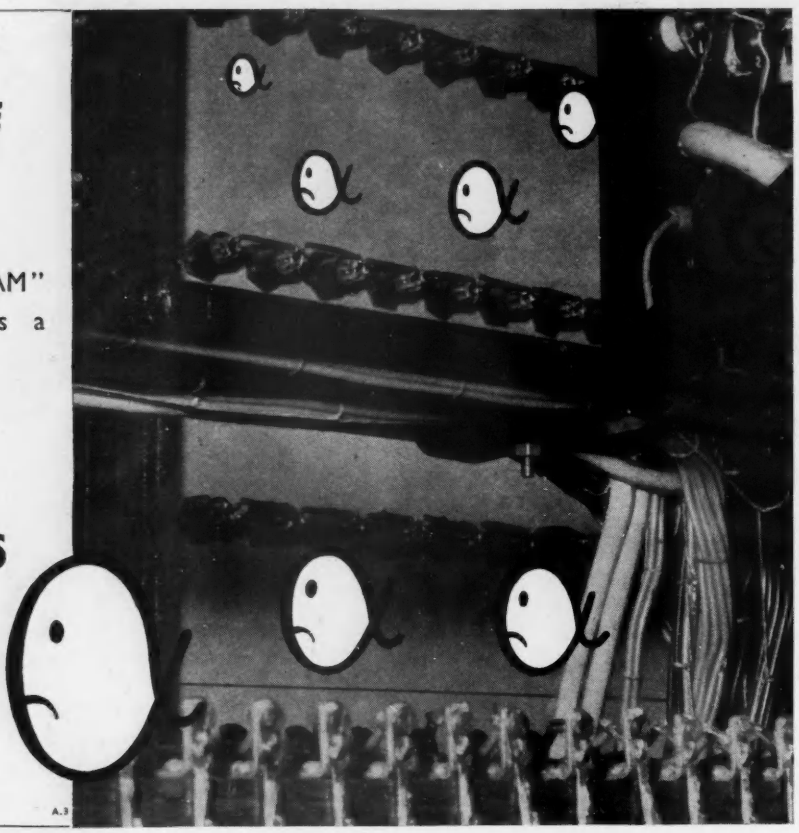

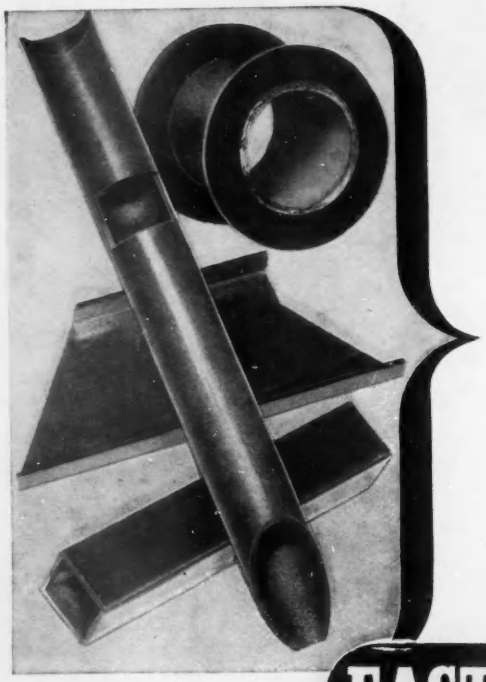

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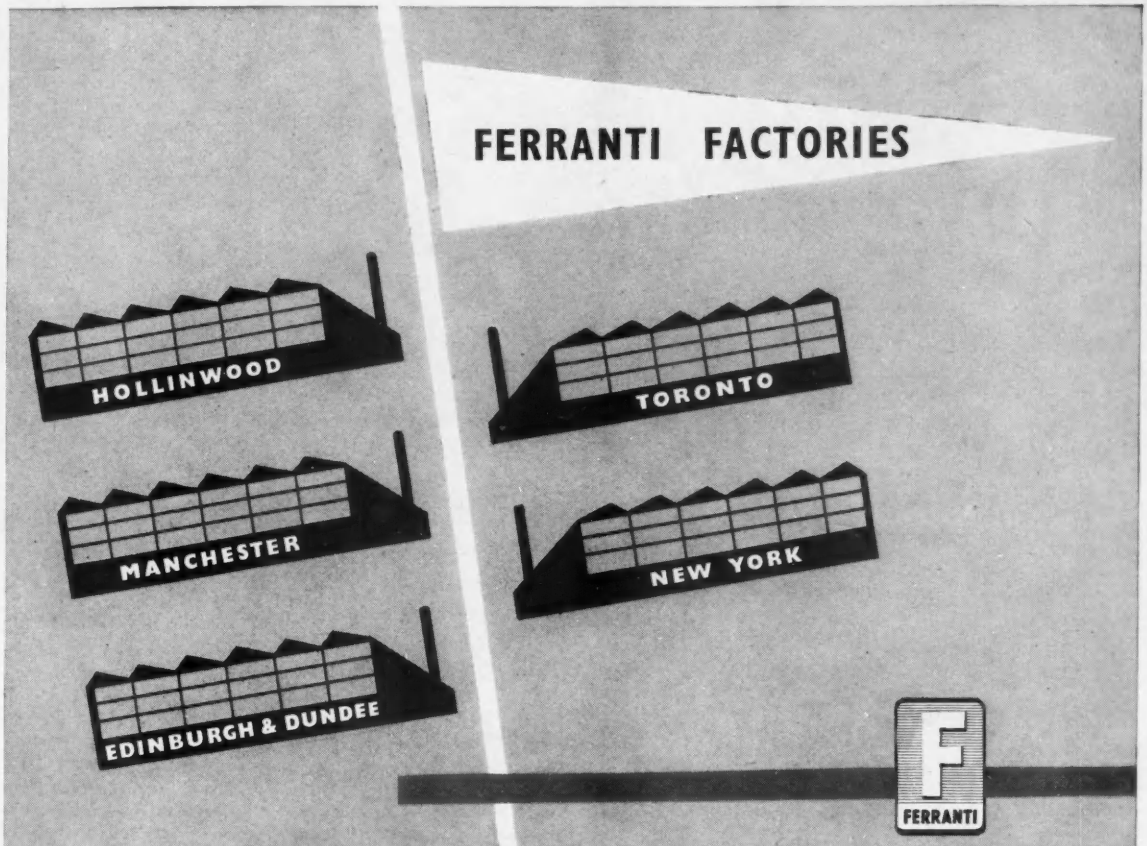

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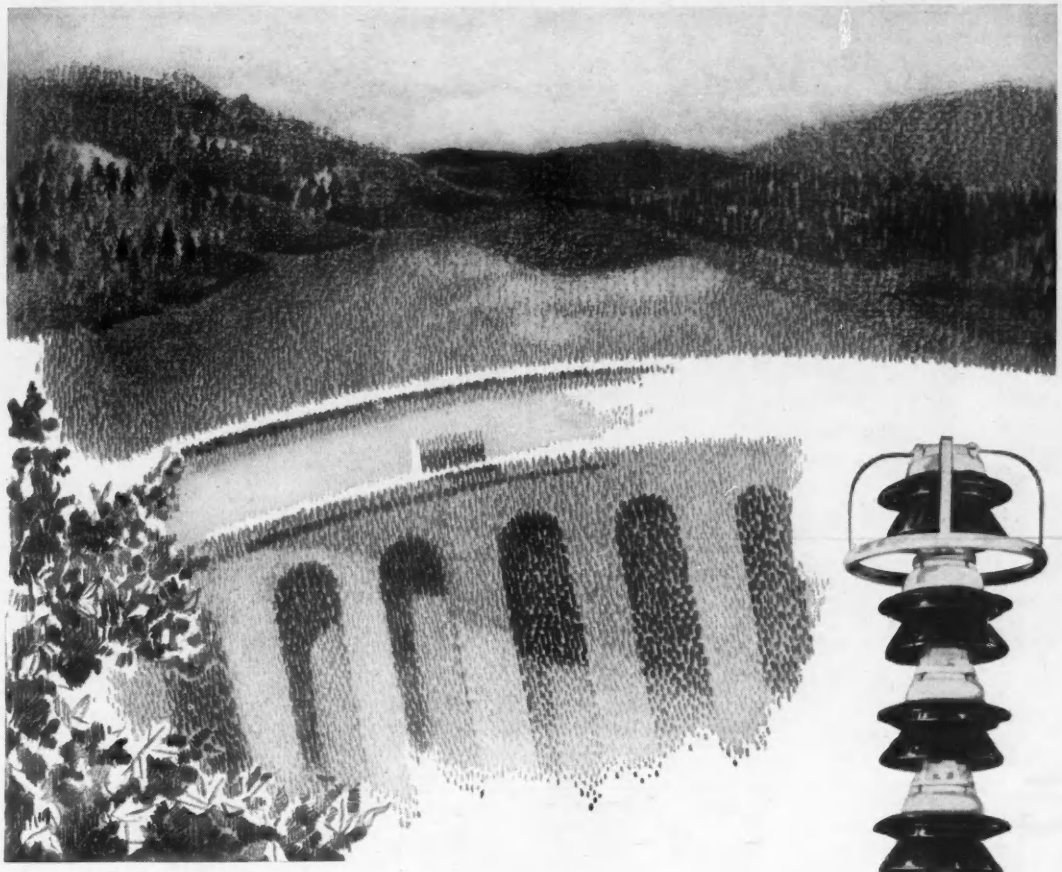

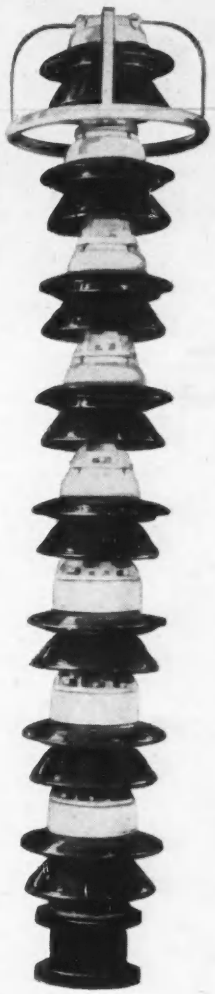

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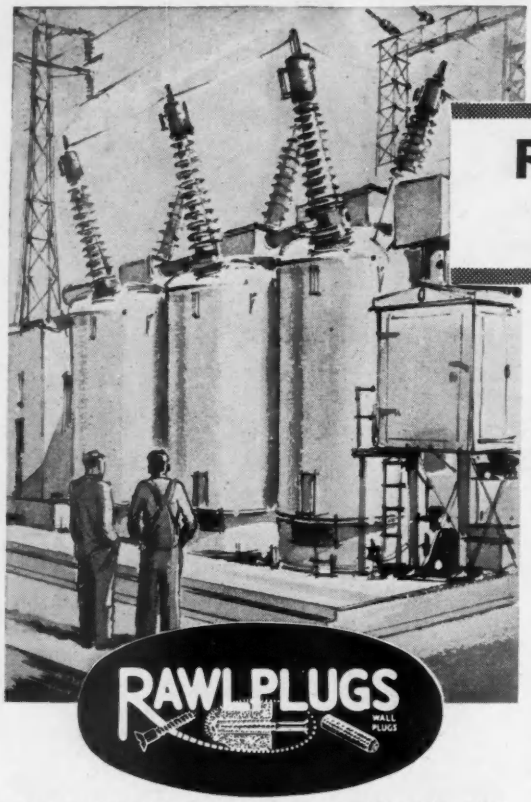

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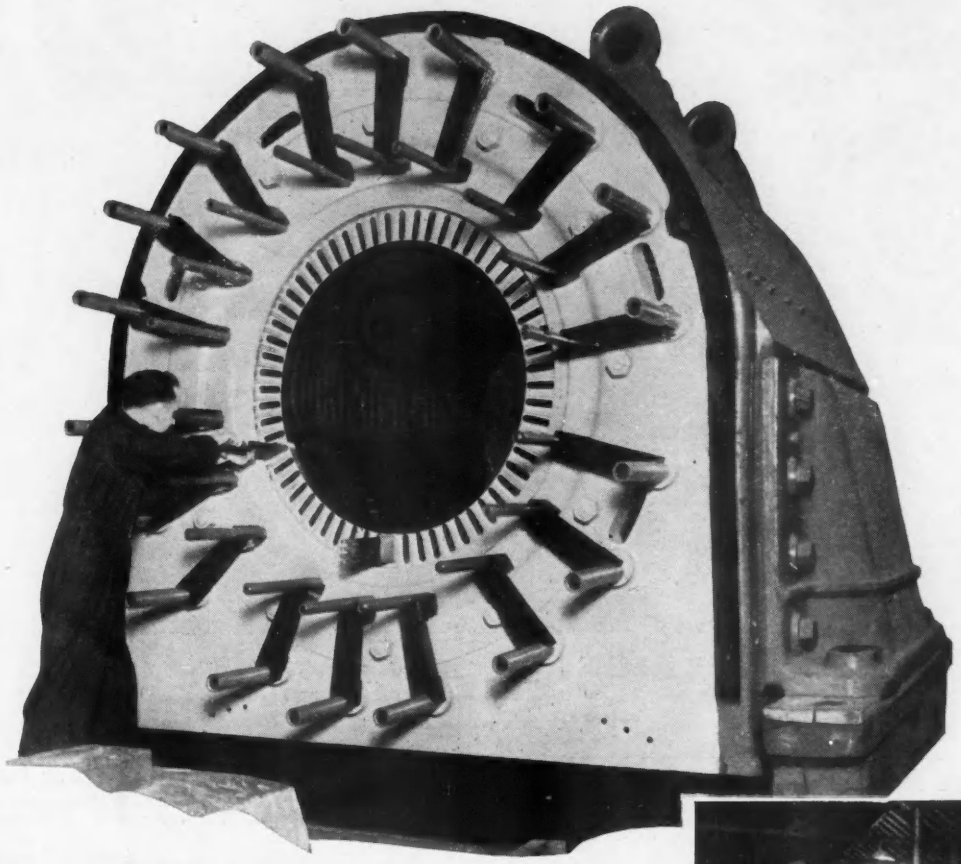

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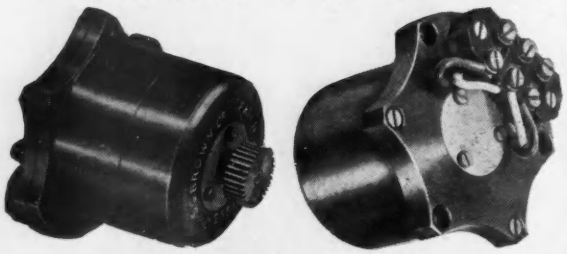

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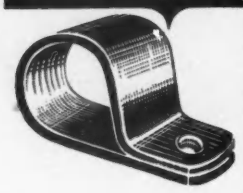

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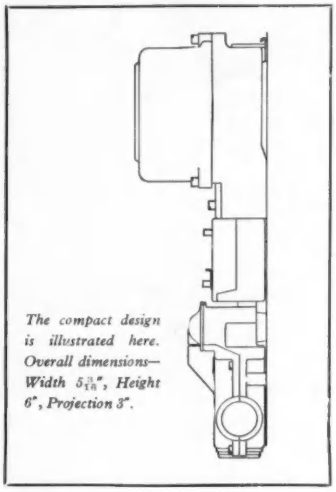

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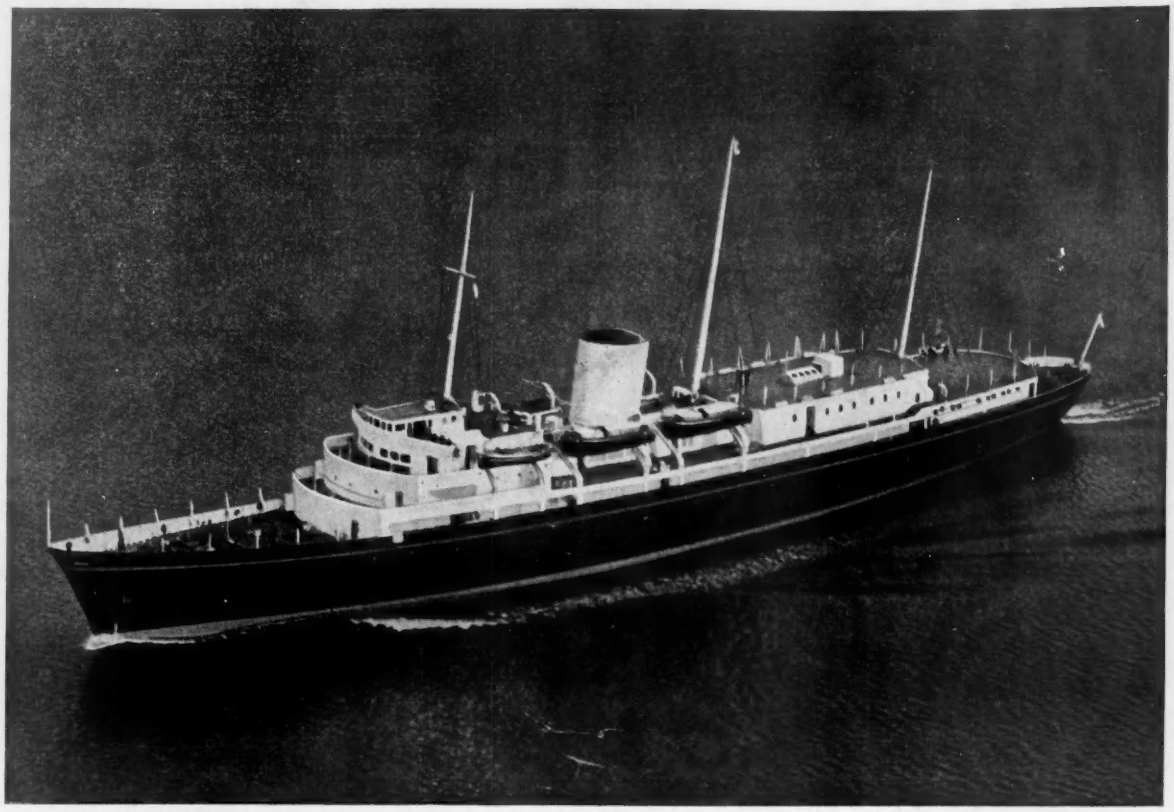

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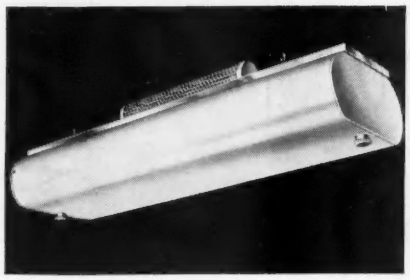

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